A MODEL FOR INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) IN TEACHER TRAINING

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ii

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IN THE NAME OF ALLAH, THE MOST MERCIFUL AND BENEFICIENT

بسم الله الرحمن الرحيم

DEDICATION

This thesis work is dedicated to my children Mubashir, Mahnoor, Eman and Mudassir who sacrificed their time and supported me during studies.

A special appreciation to my wife, Qamar Faheem, whose care and patience remained a great source of encouragement, motivation and inspiration.

Also, this thesis is dedicated to my late mother and father. My father, late Ali Akber, who not only elevated my belief in merit but taught me always to accomplish the dreams of life with hard working only. Over the years he supported for educational excellence with patience.

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APPROVAL SHEET

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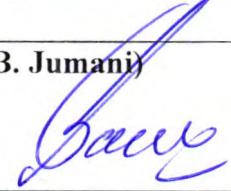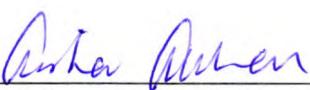
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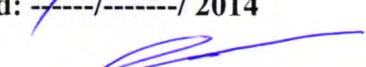(Prof. Dr. N.B. Jumani)

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ABSTRACT

The use of information and communication technology (ICT) in education has revolutionized teacher education and use of innovative approaches in teaching methodology has changed teaching and learning process. To find out the impact of ICT in teacher education, this study was conducted to (i) examine the level of integration of ICT in exiting pre-service Bachelor of Education (B.Ed) program offered by Government Colleges of Education and Provincial Institute of Teacher Education, (ii) evaluate the competency deficiencies of teacher educators in use of ICT in teaching and learning process, (iii) analyze the need assessment of B.Ed trainees in terms of use of ICT and, (iv) develop ICT-supported training model for teacher educators.

The population of the study was four (04) male and female Heads of institutions, thirty seven (37) teacher educators of B.Ed classes and four hundred and nine (342) B.Ed trainees of all Government Colleges of Education including Provincial Institute of Teacher Education. The census sampling was used to select all the four (04) Heads of the institutions and thirty seven (37) teacher educators. However, a simple random sampling technique was used for the selection of B.Ed trainees. The sample thus consisted of four (04) male and female Heads of institutions, thirty seven (37) teacher educators of B.Ed classes and one hundred forty seven (147) B.Ed trainees of all Government Colleges of Education including Provincial Institute of Teacher Education.

A mixed method approach, using both quantitative and quantitative method, a concurrent triangulation strategy, was used for this study. Data was collected through questionnaires, focus group discussion, in-depth interviews and classroom observations. The questionnaires were designed to collect the quantitative data and focus group

discussion, in-depth interviews and classroom observations were used to obtain the in-depth knowledge for qualitative analysis. In addition to this research, the researcher conducted pilot test for the application of developed ICT-supported model in routine class courses focusing integration of ICT in teaching and learning process.

The findings of study show the very low level of ICT-supported teaching due to lack of facilities and resources, but study found very positive perceptions among the teacher educators, heads of institutions and B.Ed trainees towards integration of ICT in teacher education program. The overwhelming majority of respondents showed willingness to use ICT in classroom teaching. However, the study found that teacher educators require more training on new ICT-integrated pedagogical approaches for the improvement of their ICT skills. The pilot testing of model found significant impact on teaching and learning process. The research suggests several key reforms for policy makers and recommendations for head of institutions, teacher educators and B.Ed trainees. For policy makers, this study proposes that teacher education curriculum should be revised and reforms be made in assessment method using ICT according to the international standards along with the provision of ICT tools and digitalization of classrooms. The study also recommends that at college level, heads of institutions may make serious attempt to encourage ICT-supported environment for both teacher educators and B.Ed trainees and existing resources be fully utilized at maximum level. In addition, the B.Ed trainees be encouraged by teacher educators to prepare the assignment using electronic sources and project-based techniques, evaluation methods, and computer based assessment be used by teacher educators to encourage integration of ICT in teaching learning and assessment process.

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(Faheem Abbasi)

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIXES

CHAPTER ONE

INTRODUCTION

Information and Communication Technology (ICT) is a marvelous changing force in 21st century which has significant impact in every sector of development including education and training. In traditional education system, education and training was transfer of knowledge form teacher to student in one direction and classroom teaching as a whole was considered as main educational methodology.

The Information and Communication Technology in education has changed the teaching paradigms. The regular use of ICT in teacher education has been a great challenge to shift traditional teaching approaches to ICT-supported teaching and learning process.

UNESCO (2009), portraying the current situation of traditional education system and highlighting the importance of ICT in education, states that:

> The challenges of traditional education systems are amplified by the rapidly
> changing skills in demand in a globalizing labour market. New paradigms are also
> emerging where the delivery of education becomes less about teaching and more
> about learning (i.e. via self-tutoring and the use of individualized information
> research abilities). Education becomes increasingly less confined within the sole
> geographical location of learners (e.g. a country) or less dependent on a physical
> space (e.g. a classroom for pooling a critical mass of learners together). More
> flexibility is required in order to be adjustable to learners, with modular curricula

no longer constrained by a rigid schooling path or predetermined certification goals. (p.11)

There is now consensus that pupils may be guided and prepared to learn independently (Pelgrum, 2001). It is important to note that integration of ICT in education and training has reshaped teaching paradigm. From classroom teaching to teaching methodology, new approaches and trends are being adopted to make teaching and learning more effective and efficient. In addition, it is also a fact that technology has provided several opportunities to find the solution to problems not only in education, but in routine life. Moreover, technology has forced people to change the ways and techniques for the solution of education problems to achieve the goals of education. It is now imperative that people have to change themselves in accordance with the advancement of technology.

The integration of ICT in education has not only changed the pace of development in education system, but created a great challenge to develop a capacity for change and "the use of ICT in education can increase access to learning opportunities. It can help to enhance the quality of education with advanced teaching methods, improve learning outcomes and enable reform or better management of education systems" (UNESCO, 2009, p.8).

Many initiatives have been taken to integrate ICTs in teaching learning process, but there are many areas of concern yet to be solved with the passage of time, particularly digital divide. It is important to highlight the impacts of ICT on teaching and learning process. It is worth mentioning that the use of ICT in teaching and learning process has a

significant impact on the training of teacher especially in the areas of comprehension, problem solving, composition and mathematical layout that will sustain both learning and effective functioning in the life. In addition, integration of ICT in education is a systematic approach to assess the total process of learning, designing, developing, utilizing and evaluating the instructional strategies and their management (Venkataiah, 2008).

In future, economy of the world will be the digital economy so education systems have to incorporate ICT in teaching and learning process to train ICT-skilled persons and information management will be the most important source to transfer knowledge (Peters, 2001). Therefore, it is responsibility of all national education systems to train prospective teachers fulfilling the criteria of digital literacy instead of conventional literacy (Paun, 2003).

The role of teacher is very vital to apply ICT in teaching methodologies so that all students may acquire the required skills and knowledge which is pre-requisite for modern communicative society (Davis, 1997). She further states that the professional development of teachers, particularly integration of ICT in teaching practices require appropriate academic actions. In this regard, ICT skills are critical to shift from old paradigm approach to new emerging ICT- supported teaching paradigm.

It is therefore pertinent to improve the quality of teacher educators in using ICT and its impact on teachers' confidence and competencies to ensure that ICT may continue to be an integrated part of teaching learning process (Dash, 2011). Integration of ICT in classroom teaching has reshaped the students' learning through involvement with challenging tasks. Using ICT tools, innovative teaching strategies have been developed

3

which has provided new roles for teachers' professional requirement including creation of a culture that supports learning both in the classroom and beyond the school walls (Narasaiah, 2007). The day to day advancement of technology quickly changes pace of new technology replacing old technology. Therefore, integration of ICT in teacher education is requirement of time to improve teaching and learning process and enhance learning achievement through usage of different ICT tools in teaching practices (Srinivasan, 2002). Moreover, ICT and teachers must work together to render ambitious learning opportunities so that integration of ICTs in teacher education training programs could bring advances that would improve teaching and learning process.

The basic aim of educational reforms in education through integration of ICT is to improve learning achievements, using ICT tools, improving competencies of teachers and providing effective learning opportunities. However, one group of teachers believe that use of ICTs in teaching and learning methodologies represent the solution to many problems while other group is of the opinion that through ICT, teachers get new ways of accomplishing tasks of teaching the skills that students need to learn (Siddiqui, 2004).

The Association for Educational Communication and Technology (1994) has identified the five domains of educational technology. They are: design, development, utilization, evaluation and management. According to Geisert & Futrell (1995), integration of ICT in education can revolutionize classroom teaching which have very positive impact on teaching and learning process. It is very significant to describe that applications of ICT in education provide pre-eminent tools for information processing and find solution to problems. Therefore, new teachers need to become competent in their use with required

4

skills. However, ICT can be used to improve students' understanding and learning to increase the quality of education, knowledge creation and knowledge sharing which can contribute to the transformation of the education system from stereotype teaching to modern ICT-integrated teaching methodologies (Kozma, 2005). It is also believed that use of ICT in education and educational broadcasting should be fundamental management tools for teaching learning processes at all levels of an educational system (Srinivasan, 2002). Therefore, teaching institutions should profoundly revise present teaching practices and resources to create more effective learning environments and improve life-long learning skills and habits in their students.

It is a fact that ICT can be applied to improve teaching learning process and its application in education to support sustainable economic development including social transformation. In Pakistan, introduction of technology in education within the framework of National Education Policy (1998-2010) resulted in increased computer laboratories, but effective utilization of ICT is still unresolved. In addition, with support of USAID, National ICT policy was designed but not much more achieved in practice. Consequently, it is necessary to study the use of Information and Communication Technology by teacher educators and strengthening teacher education in Government Colleges of Education for effective implementation of ICT in teaching methodologies and integrate ICT-based training programs.

In Pakistan, Government Colleges of Education are responsible for the pre-service training program (B.Ed) for primary school level education including in-service trainings. Majority of teacher educators use old lecture method of teaching. A few teacher educators

had the basic knowledge of computer. Though, most of the teacher educators consider Information and Communication Technologies as an integral part of teaching learning methodologies. The integration of ICTs in teaching methods will change the existing teaching learning process.

The purpose of this study was to assess current perception of teachers regarding use of ICT and their willingness to implement ICT in their professional contexts. In addition, the purpose of this study was to explore the competency deficiencies in terms of ICT and barriers in use of ICT in teaching learning process including strengthening ICT-integrated training for teacher educators. On the basis of findings, the aim of this study was to develop ICT supported teaching model of pre-service training program for prospective teachers. The National ICT Strategy of Pakistan and B.Ed curriculum suggested by Higher Education Commission of Pakistan (2009) proposes the use ICTs to enhance teaching quality by supporting and reinforcing the use of innovative teaching practices. Teachers need to learn ICT skills as well as how to integrate them into the teaching system. Integration of ICT supports teachers in applying technology in a learner-centered context by modeling lessons in live classroom situations. ICT also provide content knowledge and curriculum support by providing internet access/CD ROM-based software to schools, professional development centers, and teacher training institutions to help pre-service and in-service training to expand the content knowledge of teachers.

1.1. Statement of the Problem

Integration of information and communication technology has revolutionized teacher education and teaching and learning process. Pakistan has taken many initiatives to integrate ICT in both pre-service and in-service teacher education but the required results have not been obtained. Keeping in view the slow pace of integration of ICT in teacher education, this research was carried out to identify the barriers in using ICT in teacher education program, perception and willingness of teacher educators, impact of ICT on teaching and learning process and competency deficiencies of teacher educators regarding the use of ICTs in classroom teaching. In addition, on the basis of findings, researcher intended to develop an ICT- supported model for teacher education program.

1.2. Objectives of the Study

The study has the following overall key objectives:

1. To examine the level of integration of ICT in exiting pre-service Bachelor of Education (B.Ed) program.

2. To explore the existing status of teacher educators' competencies and deficiencies in the use of ICT in teacher education at Government Colleges of Education.

3. To analyze the ICT-based needs of B.Ed. trainees.

4. To develop ICT-integrated training model for teacher educators.

1.3. Research Questions

On the basis of research objectives, the following research questions were devised for this study.

1. What are the existing practices of teacher educators regarding the use of ICT in teaching learning process?

2. How do teacher educators perceive integration of ICTs in their teaching learning process?

3. What are the capacities of Government Colleges of Education in terms of ICTs delivery into different subjects?

4. What are teacher educators' perceptions of their competencies to use ICT?

5. What factors influence the teacher educators in use of ICTs in teaching?

6. How teacher educators will take ICT in the future teaching learning process?

7. What are the suitable and convenient ways of using ICT in teaching learning process by teacher educators?

8. What are the requirements of B. Ed. trainees with regards to ICT?

8.1. Hypotheses

1. There is no association between the access of the ICT tools and its usage.

2. There is association between the usage and access of ICT tools.

1.4. Significance of Study

This study is expected to be significant and useful for policy makers, teacher educators, researchers, prospective teachers and other stakeholder who are involved to

8

promote teacher education in Pakistan for several reasons. It provides an understanding

and user knowledge regarding the use of ICT in teaching and learning process, their

willingness to use ICT in classroom teaching and future prospects of integration of ICT in

teacher education program. This study would be beneficial for teacher educators, heads of

institutions and policy makers to make efficient use of ICT in teaching and learning

methodologies for the teacher training programs. This study would also be supportive in

providing a clear picture on competencies of teacher educators and level of ICT use in

teaching and learning process. The results of study might highlight major barriers in ICT-

supported teaching and learning process which provide comprehensive data for the policy

makers and teacher educators for remedial measures. Last but least, this study would be

very helpful in providing a stronger foundation for formulation of ICT-related policy in

teacher education institutes across Pakistan. The study results may also guide further

avenues of research in this field.

1.5.   Delimitation of Study

Firstly, the study was confined to government colleges of education in Sindh province

and Provincial Institute of Teacher Education (PITE). Secondly, the study was delimited

to teacher educators of B. Ed only and lastly this study was delimited to B.Ed trainees

enrolled in year 2011.

1.6.   Research Design

The research design is a plan or procedure adopted to collect the information on subject of

study of research. The research design of this study is discussed below.

1.6.1. Research method

The study was designed to investigate the use of ICT in teaching-learning process by teacher educators and development of ICT-integrated training model for pre-service teacher education program. In order to address the research questions of the study, mixed method approach including both the qualitative and quantitative methods were used. The concurrent triangulation strategy was used applying mixed method approach.

1.7. Population

All the four (04) colleges of education in Sindh and Provincial Institute of Teacher Education Sindh (PITE) were the population of study. The following population was catered under this study;

1) **Head of institutions:** All male and female head of institutions were population of the study.

2) **Teacher Educators:** The second population of study was 37 teacher educators of B.Ed classes.

3) **B.Ed trainees:** The third population of study was 342 B.Ed trainees who were enrolled in Bachelor of education program.

The Government College of Education Sukkur, Government College of Education F.B Area, Block NO. 15, Karachi and Government College of Education Jamia Millia, Malir Karachi in Sindh province and PITE Sindh were covered under this study. The detail of population is given in the below table.

Table 1. Population of the study

S. No.	Name of College	Head of institution	Teacher Educators	B.Ed trainees	Total
1	Government College of Education Sukkur	1	18	130	149
2	Government College of Education F.B Area, Block NO. 15, Karachi	1	11	120	130
3	Government College of Education Jamia Millia, Malir, Karachi	1	9	28	40
4	Provincial Institute of Teacher Education (PITE), Benazirabad	1	9	64	74
Total		4	47	342	393

1.8. Sample and Sampling

Census sampling was used to select all the Heads of the institutions and teacher educators. The sampling techniques for B.Ed trainees was simple random. Sample size

justification implies that the minimum sample size should be around 200 from a population of the size of 500-1000 (Smith, 2004). The detail of sample size is given in the below table.

Table 2. Sample Size

Sample	Size of the Sample	
Principals	4	100%
Teacher educators	47	100%
B.Ed trainees	171	50%
Total	222	

1.9. Research Instruments

Research instruments are tools which are used to collect the data regarding the subject of research study (Creswell, 2009). Multiple research instruments were used for the data collection and following tools were used for this study:

(1) The questionnaires

    i. Questionnaire 1 for teacher educators &

    ii. Questionnaires 2 for B.Ed trainees

(2) Focus group discussion for teacher educators

(3) Classroom observations and

12

(4) Interviews from head of institutions

1.9.1. Questionnaire

Separate questionnaire for teacher educators and B.Ed trainees were designed in order to collect the information from teacher educators and B.Ed trainees about different dimensions of ICT. The researcher could not find any existing questionnaires to fulfill the requirement of research design; therefore, he designed the questionnaires to gather the information of interest. The researcher himself collected the data and he personally visited all the institutions which were population of the study. Biographic information was collected through these questionnaires. Information from the teacher educators and B.Ed trainees were gathered regarding the awareness about integration of ICTs into teaching learning process and existing teaching methodologies. The information regarding the existing ICT facilities available in the institutions were collected through questionnaires. The questionnaire also catered for the suggestions of teacher educators and B.Ed trainees about the integration of ICT in training Program. Two questionnaires, one for teacher educators and other for B.Ed trainees were used for the survey to get data from teacher educators and B.Ed trainees respectively. Information from the teacher educators and B.Ed were gathered regarding their awareness about integration of ICTs into teaching learning process. Information on existing teaching methodologies and the existing ICT facilities available in the institutions were collected though classroom observations and questionnaires respectively.

1.9.2. Focus Group Discussion (FGDs)

Focus group discussions were held with teacher educators to obtain in-depth information regarding their experience in ICT and their willingness and attitudes towards use of ICT in teaching and learning process. In addition, focus group discussions (FGDs) were conducted by the researcher in order to seek the opinion of the teacher educators regarding use of ICT and explore the barriers and competencies deficiencies of teacher educators in terms of ICT.

1.9.3. In-depth Interviews

Semi-structured questions were drafted by the researcher to obtain the in-depth information from head of institutions (principals of colleges of education and Director General of Provincial Institute of Teacher Education). In-depth interviews were conducted with the head of institutions in order to seek in-depth knowledge about integration of ICT. The focus was primarily to seek particular evidence if there was supportive environment in the institutions for implementation of ICT. It helped to triangulate the data collected through questionnaire.

1.9.4. Classroom observation (Class room practices)

Classroom observations in natural settings provide researchers good insight to understand the area of study. Best and Kahn (2007) also suggest that observation consists of detailed notation of behaviours, events and the surrounding context to help researchers to understand the depth of beliefs and practices. They further add that this tool is usually employed to collect the data regarding the number of occurrences in specific period of

time for specific behaviour or event (Best & Kahn, 2007). In this study, the researcher obtained information through classroom observation during the research. However, the researcher allowed the teacher educators to conduct classes in their natural settings. Participatory observation was used to gather different evidences and data to develop strategies for rest of the research study.

1.10. Validation of Research Instrument

The tools of research were developed by identifying the factors on the basis of comprehensive review of literature. By using the expert opinion, identified parameters were translated into statements and the arrangement of the statements with the parameters to ensure the validity and reliability. If the questionnaire cannot be shown to be reliable, there is no validity. Cronbach's α (alpha) is commonly used as a measure of the internal consistency or reliability. Factor analysis was run on the data collected in the piloting procedure. Pilot testing was administered by the researcher to the sample.

The validity test was used to ensure that instruments were measuring for what they were set to measure.

DEFINITATIONS

1) **Provincial Institute of Teacher Education (PITE):** Teacher training institute to promoting and strengthening the teacher education in the Province of Sindh.

2) **ICTs:** Informational and Communication Technologies used in teaching and learning process.

3) **Computers:** Electronic devices used to compute, store, process and analyze the data using different program instructions.

4) **ICT-supported model:** A set of Informational and Communication Technologies instructions using various tools to improve teaching and learning process.

5) **Teacher Educators:** The instructors in colleges of education where prospective teacher are trained through pre-service and in-service education.

6) **B.Ed trainees:** The prospective teachers enrolled in Bachelor of Education, a pre-service education program offered by colleges of education.

7) **Traditional education:** The process teaching and learning before the advent of information and communication technology.

8) **Digitalization:** Adaptation and access of digital information

9) **Multimedia:** Use of various mediums for communication, particularly using electronic tools and ways.

10) **Pre-service training:** A training program of or a course of education offered to prospective teachers.

11) **In-service training:** The in-job training program or a course of education offered to the teachers.

12) **Use ICT to extend the reach of educational opportunity:** Utilize ICT creatively to assist teacher educators and B.Ed trainees with a wide range of abilities and determine the context and needs of the B.Ed trainees and teacher educators

13) **Apply ICT to strengthen the quality of teaching and educational management:** Use ICT to maximize opportunities for educators' continuous learning and to help educators understand and effectively use ICT.

14) **Employ ICT to enhance student learning: Integrate ICT into schools and learning** centres to support students' self-paced learning and provide them with chances to explore, investigate, reflect, learn social skills (such as collaboration, logical reasoning, and creative expression), and enhance self-esteem.

15) **Develop complementary approaches to using ICT in education:** Support students and teachers in developing key ICT competencies (including sophisticated problem-solving and critical thinking skills) by treating ICT as a school subject, as well as a critical instructional aid.

16) **Build on the current experiences of existing and successful ICT programmes:** Gather, organize, provide access to, share, and use for planning purposes national and international data on effective approaches to using ICT in education.

17) **Develop capacity at the federal and provincial department of education levels::** Form a new office of the government to represent the cause of ICT in Education and advise the MoE

Sources: Ministry of Education. (2006). *National Information and Communication Technology Strategy for Education in Pakistan.* Retrieved from http://www.moe.gov.pk/Publications/NICT_Strategy_For_Education_in_Pakistan.pdf

17

ICT is considered a very efficient and effective tool for teaching and learning process with a systematic approach to solve the problems of education (Rao, 2005).

UNESCO (2004), highlighting the importance of Information and Communication Technology (ICT) in teacher education, states:

In the early days of technology use, the focus was on the delivery of direct instruction (e.g., interactive radio, instructional television). Instructional technologies were widely used for this purpose in low-income countries that include the use of programmed instruction, the distribution of lessons on radio tape, the use of duplicating and photocopy machines to prepare learning aids. Newer technology-based instructional strategies, incorporating internet and World Wide Web(WWW), are used more to expand communication and increases access to resources. (p.23)

The transition from print media to new forms of communication necessitates integration of ICT in professional development program (Varis, 2011). The present generations of talented youths need to become competent in their use of ICT. They also need them to be able to implement their skills. Therefore, ICT and teachers must work together to render ambitious learning opportunities. The influence of technology in teacher education has reshaped teaching methodologies. According to Johannessen (2009), ICT has significant impact on education and learning. It will not be exaggerated to say that integration of ICT in teacher education has changed the pace of professional development.

Although many initiatives have been taken to integrate ICT in the teaching learning process, there are many areas of concern which need to be addressed. However, ICT skill

development in teacher educators is very important in teaching methodologies. UNESCO (2004), mentioning the characteristics of ICT in teacher education states "with the effective use of ICT, teacher-centered lectures are moved to more student-centered, constructive learning strategies in which students are expected to research information, analyze data, and draw their own conclusions" (UNESCO,2004,P.298).

The use of technology has influenced people in every aspects of life including achieving the goals of education. Frequent use of ICT and its integration in education has forced people to adapt themselves in accordance with the advancement of technology. Therefore, it is the responsibility of all national education systems to train digitally literate teachers (Paun, 2003).The pace of technological advancement indicates that in the future, economies of the world will be digital so it is fair to state that education systems will need effective skills of ICT to achieve the goals of education in which trainee teachers play an important role in education system. The role of the teacher is vital to apply ICT so that all people may acquire the required skills and knowledge of a communication-based society (Davis, 1997). Davis further states that the professional development of teachers in ICT and appropriate academic skills are critical. Therefore, it is very important to obtain ICT skills.

The quality of educators in the use of ICT and its impact on the confidence and competence levels of educators is most important in ensuring that ICT continues to be an integrated part of the teaching learning process. The Association for Educational Communication and Technology (1994) has identified the five domains of educational technology. They are: design, development, utilization, evaluation and management. In

addition, integration of ICT in classroom teaching has a significant impact on the training of teacher trainees, particularly in problem solving that will sustain both learning and effective functioning in life. Using ICT tools in classroom teaching, teachers can revolutionize their classrooms. (Geisert & Futrell, 1995). Technology has not only reshaped student learning through involvement with challenging tasks, but they provide new roles for B.Ed trainees and teacher educators with high quality of professionalism.

Use of ICT and its applications in teaching and learning process can improve the learning outcomes and support sustainable economic development including social transformation. ICT can be used to improve students' understanding and learning, increase the quality of education, knowledge creation and knowledge sharing which can contribute to the transformation of the education system from stereotype teaching to modern ICT-integrated teaching methodologies (Kozma, 2005).

Some educators believe that the use of ICT in teaching- learning and learning methodologies represent the solution to many problems, while others are of the opinion that through ICTs, educators gain new ways of accomplishing tasks and of teaching the skills that students need to learn. According to Kukharchik (2011), "the main instrument of effective modernization of the national education system consists of the large-scale introduction of information and communication technologies into the educational practices". (p.34)

It is also believed that ICT should be a fundamental management tool for the teaching learning processes at all levels of an educational system. Therefore, teaching institutions should revise present teaching practices and resources to inculcate a more effective

21

learning environment and improve life-long learning skills in their students. In Pakistan, introduction of technology in education within the framework of National Education Policy (1998-2010) was a very positive step towards integration of ICT but the policy reforms only resulted in establishment of computer laboratories and enhancement of basic computer skills. The policy decision could not have been translated into effective utilization of ICT in teaching and learning process.

2.1. Relationship between Education and ICT

The United Nations Educational, Scientific and Cultural Organization (UNESCO) recognizing the relation between ICT and education states:

With the challenges faced by the international community in meeting the Millennium Development Goals (MDGs) and the Education for All (EFA) targets, it seems unrealistic to assume that conventional delivery mechanisms will ensure quality and equal educational opportunities for all in affordable and sustainable ways by 2015. Indeed, the biggest challenge for many education systems is to be able to offer training or learning opportunities on a lifelong basis to all individuals and, more importantly, to the traditionally under-served or marginalized groups (i.e. girls and women who face barriers to schooling; rural populations that are too dispersed to populate regular schools cost-effectively with reasonable class sizes; children from families in extreme poverty; special needs groups or persons with disabilities who have no access to learning centres; etc.).(UNESCO, 2009, p.11)

Advancement of technology has started a debate to find out the relationship between ICTs and education. Owen (2004) recognized that "use of information technology will

22

fundamentally change the way we think and learn and thus change education and curriculum" (p.34). The most important point of debate is on new role of teacher, the impact of integration of ICT on teaching learning process and new trends in professional development.

There is a close relationship between ICT and lifelong learning and digital literacy which is a pre-requisite of the digital world. Frequent use of ICT in teaching methodology is linked with efficiency of teacher and performance of students (Pulist, 2010). Explaining relationship between ICT and education Chandra (2004) pointed out that "in the world of technology, ICT is contributing the long term possibilities, adult training and e-training for the work place." (p.17)

Shift in teaching paradigm particularly the use of computer, softwares, internet, CD-ROM, video and other applications of technological tools have played a vital role in achieving the educational objectives. They have reshaped the systems of education, changed the structure of society and have considered the world as an interconnected global village. The close relationship between ICT and education has provided means of communication, shared individual growth and responsibilities in education system (Volman, 2005). It is not a matter of concern whether ICT is used by teachers in teaching practices, but how it has been integrated to change teaching methodlogy, provide learning oportunities to students and contribution in lifelong learning and educational objectives (Engida, 2011). Advancement of technology and its applications bring radical shifts in society to attain new knowledge and modernize teaching methodologies, therefore, the

connection between ICT and education is the requirement of time to achieve goals of education.

2.2. Role of ICT in Education

ICT is very effective and efficient sources of communication. It provides opportunities to share knowledge through networks and communication media (Adeya, 2002). In other words, ICT is an accumulation of different tools and resources used for sharing information, knowledge creation and managing systems using different means of communication that include computers, internet and multimedia technologies (Mayer, 2008). At the end of the 1980s, Information Technology (IT) replaced the usage of computers from computing information to design and management with enhanced role in educational achievements (Pelgrum& Law, 2003). According to United Nations report (1999), ICT is from basic computer applications to internet services, from telecommunication equipment to broadcasting tools and from multimedia to hypermedia networks and information. Its major role is to facilitate as a source of communication and sharing information and knowledge.

The role of ICT is changing from time to time due to rapid changes in means of communication and applications. It is important to mention here that when ICT has replaced IT, the role of ICT in education is increasing day by day. While discussing the role of difference between IT and ICT, Galloway, & Norton (2011) stated:

The term IT (Information technology) and ICT (information and communication technology) are often used interchangeably, although the latter term is little known outside of education. Generally schools think of IT as being the technology, the

24

importance of ICT for advancing robust learning strategies on the side of the students. A second area is ICT as a tool for the support of personalization strategies in teaching and learning. (p.13)

Use of ICTs in educational processes to achieve the goals of education has a revolutionary role in instruction and education using various instructional tools. Narasaiah (2007) points out that "Technology related skills among the staff concerned, particularly teachers and trainers, need to be improved" (p.6). The important role which has significant impact on teaching and learning process is its contribution in achieving the goals of education which has transformed the way of instruction which has great potential for learning.

2.3. Advantages of ICT in Education

There are countless advantages of ICT and its common use for the achievemnt of educational objectives. Speedy advancement in ICT supports student to find out resources and fulfills specific learning desires in accordance with their requirement (Murphya, & Greenwooda, 1998). Easy access to information has provided opportunity to share information of common interest and understand others' ideas using ICT resources and different electronic means of communication. However, the capabilities required for professional expertise have been reshaped with the integration of ICT in education and redefined the nature of skills that are required for different professions. (Sharma, 2009).

In the age of digital literacy, advantages of ICT are directly linked with new skills required for integration of ICT in education (Tino, 2008). Using technology in education is an innovative idea and teacher educators have to be receptive to adopt new methods in

26

whenever ICT is used to support the teaching and learning process and not specifically its content. (p.430)

Use of information and communicating technology not only increase efficiency of teacher educators, but simplifies their teaching and learning process. The advancement and increased utility of information and communication technologies has proved that it is now very important for teachers and students to use ICT in teaching and learning process (Beauchamp, 2006). On the other hand, integration of ICT improves learning outcomes of students due to student centered approach. UNESCO (2013) emphasized that "technology can support teachers by increasing their efficiency in and outside the classroom; help teachers respond better to students' individual needs; and facilitate communication between teachers, students, parents and administrators" (p.18).).

Pelgrum, & Law (2003) have explained following potential characteristics of ICT in teaching and learning process as compared to traditional paradigm: Goals and contents

1. Information, investigation, communication, and social skills, as well as meta-cognitive skills will be emphasized to a greater extent;

2. School subjects and parts of subjects will be combined with each other so that their boundaries will dissolve;

3. The learning content will be adjusted to become more relevant to real life context;

4. Students' performance will be assessed with a greater diversity of methods (open test methods, portfolios, diagnostic and summative tests).

The role of teachers has been discussed in detail which shows that;

1. Teachers will use more instructional methods that are aimed at simulative active learning(group and individual assignments, practical work);

2. Teachers will provide guidance to students when they co-operate in the projects;

3. Teachers will share responsibility with students for decision-making in the learning process

Similarly, role of students have been explained as given below;

1. Students will be more active in learning

2. Students will be more independent(planning their own learning path);

3. Students will be more responsible for their own learning (planning and monitoring their own process) (p.32)

With the advancement of information and communication technology, digital literacy is becoming an expected dimension in the modern pedagogy. It is only through the effective implementation of ICT that teacher educators are likely to enhance their teaching skills. (Owen, 2004). However, ooutcomes and impact of self-learning is greater than that of learning from teachers. With the support of an experienced teacher educator, a trainee teacher learns the concepts, gets information and knowledge. Contrary to this position, a teacher trainer using various tools of information and communication technologies expands his ideas on same topic (Ram, 2007).

While Kalogiannakis (2010) pointed out that "teacher shows a really positive attitude towards the ICT not only by the occasional use of technology with his students, but also by the creative use of the ICT possibilities so that the educational environment, in which he acts, can be changed"(p.4).

In addition, use of ICT tools in teaching helps teacher educators to modify training material according to need of teacher trainees for enhancement of teaching and learning process. Pelgrum (2001) comments in this regard that "active learning can be facilitated by ICT."(p.165). However, exploring ideas, understanding concepts, communicating knowledge, and correcting development process are directly influenced with integration of information and communication technology in teaching and learning process in very positive direction (Pritchard, 2007)

The importance of ICT in teaching learning process is because of integration of ICT in teaching methodology. ICT has provided the student-learners the belief that it increases knowledge of students, finds out reality, provides opportunity for active learning, increases motivation of pupils, enhances output, provides opportunity for critical thinking and improves coordinated efforts for the achievement of education objectives (Newhouse, 2002). Information and knowledge are directly linked with instructional media (McNaught, & Kennedy, 2010).

2.5. Significance of ICT in Teaching Learning Process

Trinidad (2003) recognizing the significance of ICT stated that technology-rich learning environment using e-learning can engage the learner giving them a sense of empowerment. They are no longer dependent on the specific often limited knowledge of their educator. (p.110). However, Pelgrum(2001) discussing the importance of ICT in teaching explores that use of ICT is a very supportive tool for teachers which is helpful for students to explore new knowledge, proper guidance for self-learning, critical evaluation of their performance and high quality skills for communication.

31

Integration of ICT in teaching has very important significance on the learning attitude of students, creativity, knowledge construction, learning environment, teaching strategies, problem solving skills and understanding concepts using various tools. The learner has the opportunity to keep record of information in an electronic version and understand different concepts on the basis of self-learning (Owen, 2004). Different forms of multimedia channels provide information about content knowledge, understanding of different concepts, variety of approaches and expertise which support teachers and students to obtain new knowledge (Sharma, 2005).

According to Loveless, Burton, & Turvey (2006)"ICT made a contribution, not only to the creative processes and outcomes of the activities themselves, but also to a deeper understanding of pedagogy and purpose in using ICT to support learning"(p.9). It is expected that by using ICT in teaching, teachers can enhance their competency and effectiveness in classroom teaching (Ertmer, & Ottenbreit-Leftwich, 2010). Teacher educators have to recgnize and set up classroom settings for assignment in way so that ICT tools must be inetgral part of teaching methodology (Kalogiannakis, 2010). Another significance of ICT is that "teachers have had to learn new things and handle new teaching skills. Indeed, there are now a range of media competencies. Teachers must have to maximize the value of ICT learning in classrooms." (Watson, 2006, p.206).Use of ICT is increasing day by day to achieve educational objectives and its application have great significance in teaching and learning process which encourage teacher educators to use technological application for training programs. Wang (2008) pointed out that "Pedagogy. social interaction and technology are three key components of a technologically-enhanced learning environment. The researcher further elaborates that a

32

sound design of these components should enable teachers to integrate ICT into teaching and learning in an effective way (p.417).

It is important to note that use of ICTs in education has reshaped the conventional teaching approaches and provided innovative methods in teaching and learning process. (Skinner, 2010) is of the view that ICT is innovations in teaching and learning inspired by a constructivist perspective"(Volman, 2005, p.20). It plays a vital role to achieve the educational objectives.

In developing countries, major barriers in integration of ICT have been mostly due to lack of ICT-supported infrastructure and facilities in the institutions, but Arneson (2010) supports integration of ICT in developing countries. Highlighting the significance, he states:

> Although most students in developing countries don't carry laptop computers to class, they frequently do carry a flash drive with them. Students often have access to students' computer centers or internet cafes on or near campus, so they appreciate the opportunity to receive the lectures on a flash drive after the presentation to view on a computer or to print out handouts for additional study. (p.185)

In addition, integration of ICTs in education has provided many forms of communication with flexibility and ease (Inglis, Ling, & Joosten, 1999). According to Usun (2009 "ICT must be used to meet educational objectives" (p. 333). A study by Loveles at al.(2006) explains the significance of using ICT tools. They stated that:

> The affordances of ICT can also be part of this creative interaction as people exploit the distinctive features of ICT that enable digital technologies to act as tools in

33

creative processes. The uses of ICT to support and promote creativity have been described, reviewed and theorized in a range of our work in recent years. (p .4)

In general, ICT provides a supportive environment to teacher educators and help students to understand the concepts and content knowledge. Voogt (2009) concluded that "ICT contributed to an increase in a variety of student outcomes and teaching practices" (p.340). ICT has provided opportunities to access variety of material improving leaning environment and efficient delivery method (Skinner, 2010). Integration of ICT in teachning methodoloy make students active participants, provide opportunity to learn in classroom and from external sources. Besides, use of ICT enhances teamwork, encourage them to ask questions and find solution to problems (Pelgrum, 2001).

2.6.   Planning for ICTs Integration into Classroom

Chandra (2004) summarized that use of information and communication technologies in classrooms have many valuable impacts on the learner and the learning process. He identified the following impacts when ICT is integrated in the classroom:

- Allow materials to be presented in multiple media for multichannel learning.

- Motivate and engage students in learning process,

- Bring abstract concept of life.

- Enhance critical thinking and other higher intellectual skills and process.

- Provide opportunities for students to practice basic skills on their own time and at their own pace.

34

- Allow students to acquire and use information, solve problems, formulate new problems, and explain the world around them, and have access to worldwide information resources.

- Use the most cost-effective means for bringing the world in the class room.

- Offer teachers and students a platform through which they can communicate with colleagues from distant places, exchange work, develop research and function if there were no geographical boundaries. (Chandra, 2005, p.22).

Education reforms are occurring throughout the world and one of its doctrines is the introduction and integration of ICT in classroom teaching. A careful planning strategy is required for the successful integration of ICT into the classroom. This has a great impact on the teaching-learning process particularly using different tools of communication and software packages which enhance learning outcomes (Becker, 1994).

Integration of ICT provides opportunity to the teachers to become more effective in their classroom, offering numerous solutions and make teachers more efficient in teaching. It is important to note that using ICT in classroom never undermines the traditional way of teaching to maximize effective learning outcomes, but it is very important that teacher educators have skills to utilize ICT tools in teaching practices in addition to traditional teaching methodologies. For the best practices and make classroom teaching more effective and efficient, teachers require ICT skills which may be helpful during classroom practices (Venkataiah, 2008). Teaching practices supported by ICT tools and using different applications in instruction enhance learning achievements.

Paradigm shift in teaching methodology has compelled to change classroom teaching. Recognizing the challenges UNESCO pointed out that:

> The challenges of traditional education systems are amplified by the rapidly changing skills in demand in a globalizing labour market. New paradigms are also emerging where the delivery of education becomes less about teaching and more about learning. It is believed that ICT can have a monumental impact on the expansion of learning opportunities for greater and more diverse populations, beyond cultural barriers, and outside the confines of teaching institutions or geographical boundaries (UNESCO, 2009, P.11)

Using ICT and related tools in classroom teaching and learning activities increases current information and knowledge of students. Pelgrum & Law (2003) summarizing the impacts of integration of ICT in the classroom define that "access to ICT and ICT-supported educational experiences potentially offers learners valuable opportunities to learn new skills and new competencies for effective functioning in the twenty-first century" (p.120).

Use of technological tools in classrooms offers a high quality learning environment which leads toward maximum possibilities for learning achievements. The challenge of integrating technology into the classroom has provided a motivation for teacher educators to engage in continual improvements in the curriculum to equip teachers who could cope with the multifarious demands in the school environment". (Teo, Chai, Hung, & Lee, 2008, p.170).

Use of ICT in classroom teaching provides a systematic mechanism to explain the concepts according to the requirement of classroom environment, application of teaching models, teaching methodology and linking theories and practice (Sharma, 2005). According to State, Kern, Starosta, & Mukherjee (2011) "within the school system, teachers play a critical role in reducing students' social, emotional, and behavioral problems through routine practices, such as creating a positive and supportive classroom environment and providing specific prompting of and feedback for appropriate behavior"(p.13).

2.7.   Teacher Preparation, Pedagogical Approaches and Quality

The most important problem in teacher education is the preparedness of teachers in their workplace. Various studies attest the relationship of theoretical knowledge and practical skills provided to the students in their pre-service education with their effectiveness in their classrooms. (Good et al, 2006).Teacher education plays a vital role in reforming and strengthening the education system of any country. Pre-service teacher education provides knowledge and skills to the prospective teachers that are practicum to their workplace as a teacher.

Most reports about teacher education focus more on curricular issues, such as what prospective teachers should learn, or on structural issues, such as professional development schools or the length of the programs, than issues of instruction. Neither the research reports nor the reform reports had much to say about how prospective teachers should be taught. Yet in teacher education, attention to pedagogy is critical; how one teaches is part and parcel of what one teaches (Marilyn, Kenneth & Zeichner, 2009).

37

The linkages and balance between theory and practice in pre-service training programs has been a great challenge. To apply the knowledge in the workplace for teachers is a crucial challenge of the pre-service teacher education. Significant inadequacies have been identified in the research studies in this regard (Bates, 2002). The effectiveness of pre-service and in-service depends on narrowing down the disparities between theory and practice provided to the student-teachers in their pre-service teachers training (Singh, 2005).

According to Merrill (2002), learning is promoted when knowledge is applied and integrated in the real world. "Most instructional design theories advocate application of knowledge and skill as a necessary condition for effective learning (p. 6)." The traditional pre-service teacher education programs are failing in preparing teachers for effective teaching and learning in the classroom (Korthagen& Kessels,1999) . It is also essential to realize that a dominant view is emerging that theory and practice should be integrated. (Leinhardt, Young & Merriam, 1995).

The teacher education sector in Pakistan has been criticized by academicians' and researchers for low quality. Dilshad (2010, as cited in Aly, 2006; Baig, 1996; Chaudhry, 1990; Farooq, 1990; Faruqi, 1996; Farrukh & Hafizullah, 1986; Hoodbhoy, 1998; Iqbal, 2000; Jabeen, 1997; Siddiqui, 1989) identified following common problems related to teacher training in Pakistan:

There is lack of funding and resources, poorly equipped training institutions, short training period, undue emphasis on quantitative expansion, narrow scope of

curriculum, imbalance between general and professional courses, over-emphasis on theory as opposed to practice little/no coordination between education departments and training institutions, deficient quality of instruction, lack of in-service training of teacher educators, failure in implementing useful reforms, vague objectives, poor quality of textbooks, defective examination system, lack of supervision and accountability, and lack of research and evaluation of teacher training programs.(p.88)

The National Education Policy of Pakistan has rightly highlighted the problem of quality "The qualitative dimension of teacher education program has received marginal attention resulting in mass production of teachers with shallow understanding of both the content and methodology of education" (Government of Pakistan, 1998, p.47).

2.8.   ICTs and Teaching Methodology

Siddiqui (2004) believes that ICT integrated approaches can be adopted according to the requirement of students which help teacher educators to apply appropriate teaching methodology for effective learning. In traditional teaching, teachers use different stereo type strategies to facilitate students' learning and create conducive environment, but with integration of ICT, teachers can easily create appropriate learning methodology to facilitate learning process. It is important to highlight that machine instructions provide variety of solutions to problems. Therefore, use of ICT in education can over simplify learning process, enhance learning achievements and upgrade teaching and learning process (Morrison at al., 1999). However, modern teaching trends have proved that ICT is becoming integral part of teaching methodology as we are interacting with the

39

applications of information and communication teachnology and its imapct on learning achievements (Dore & Wickens, 2004).

It is important to note that teacher educators are willing to use technology in teaching and learning process. They are of the opinion that tools of technology must be used by those teacher educators who are reluctant to use ICT in teaching so that their ICT skills could be improved. According to Sharma (2009), integration of ICT in teaching methodology enables teachers to develop the potentiality of their pupils, to serve as role models, to help to reform, encourage self-confidence and creativity". (p.74)

Pedro (2005) in his research conducted on traditional and ICT integrated teaching methods highlighted "It is the change in the teaching method and not the adoption of technology that results in a higher quality of teaching" (p.403). However "The teachers who are already regular users of ICT have confidence in using ICT. They perceive it to be useful for their personal work and for their teaching and planning to extend their use further in the future"(Mumtaz, 2000, p. 323).

It is a great challenge to motivate teacher educators regarding use of ICT in teaching methodology (Baron, & Harrari, 2005). In addition, it is very important for teacher educators to equip themselves to obtain new knowledge , to be skilled in appropriate methods and adopt new strategies with the support of ICT to facilitate learning. (Ertmer, & Ottenbreit-Leftwich, 2010). Advancement of ICT and innovative training strategies has been incorporated in teacher education which is based on sustainability and transferability. Jung (2000) suggests that:

One of the best ways to develop teachers' ICT skills and promote ICT-pedagogy integration in their teaching is the provision of ICT-based training environments where on-demand access to materials, peers, and networks of experts where expertise and advices can be obtained and active discussion can take place in relation to technology or pedagogy (p.98).

Moreover, specific competencies and ICT-enriched teaching methods required for 21st century students is still a big challenge (Voogt, 2009). Use of ICT in education has a very important role in teaching methodologies with a positive impact on the way of dissemination of content knowledge and effective learning strategies (Chandra, 2004). Beauchamp (2006) elaborates his position that "teachers must incorporate the use of ICT into their pedagogy" (p.82).

2.9. ICT and Professional Development

Integration of ICTs in teaching methods for capacity building of teachers is playing very important role in professional development (Chandra, 2004). Professional development is very important phase of a teacher trainer particularly for prospective teachers. Through education and training, the teacher demonstrates fair treatment to others, shares the knowledge professionally, becomes a responsible citizen, proves a good learner and turns into service provider. Teaching and learning environment is improving day by day with the integration of ICTs and use of its application in education and training, providing variety of methods and tools for professional development (Pulist, 2010). Integration of ICT in professional development program plays very effective role

in preparing prospective teachers as well as responsible citizens. Capacity building of teachers at initial stage makes them professional.

A study by Dore & Wickens (2004) suggests that for the newly appointed teachers, it is need of hour to enhance their expertise in the different applications and usage of ICT tools which provide support to trainee teachers which is only possible through professional development pre-service and in-service programs.

Interstate New Teacher Assessment and Support Consortium (INTASC) developed a model for new teacher education which requires that trainee teachers must comprehend the notions, instruments and regulation for which they are responsible. That model emphasizes that teachers should understand the development process of students, treat children as per their comprehension level and apply different teaching methodologies (Collins, 2001).

The argument of Sharma (2009) proposed that capacity building of teachers regarding use of ICTs in teaching and its applications is very effective for overall purpose of school reforms and development. Trainees teachers enrolled in pre-service training program are guided by teacher educators regarding classroom management and professional behaviour to achieve educational objectives. Applying modern ICT-enriched teaching methods facilitates teacher trainees to develop personality, exhibit talent, demonstrate skills and attain educational goals and this is possible through professional development programs. Using ICT-enriched techniques, professional development prepares teachers to face the challenges of teaching, facilitates learning, and enhances

their knowledge regarding use of ICT tools in teaching learning process. (Cox, & Marshal, 2007).

It is therfore necessary to comprehend the comments of researchers that "the new competency- based teacher education system is sorely needed as an appropriate measurement of all competencies" (Szilagyi, &Szecsi, 2011, p.329). They further add that it is not important whether students participate in online communities and how important it is for them, but the intent of many online communities is to provide informal learning opportunities beyond what is possible in face-to-face classrooms" (Scherff, & Singer, 2008, p.153).

The study conducted by Markauskaite (2007)found that most of the teacher trainees wish to enhance and improve their information and communication technology skills during initil training or professional development program.

However, it is important to note that integration of ICT in professsional development progrmas and its frequent use has improved teaching and learning methodologies and enhanced qualitative efficiency of prospective teachers(Siddiqui, 2004).Outside the classroom environment, there are hundrends and thousands of websites which support teacher educators to fufill the requirment of professional skills (Ornstein, Levine, Gutek, & Vocke, 2010).

2.10. Rationale in the Application of ICTs in Teacher Education

New reforms in education in contemporary world are to find out effective approaches for trainee teachers. It must be linked with integration of ICT in teaching instead of its use in isolation as a technology (Morrison, Lowther, & DeMeulle, 1999).

43

He furher highlights that using ICT in teaching and learning process is emerging as important source to initiate new methods and approaches with the active participation of trainers and trainees.

It is very important to understand that the conventional teacher education programs are based on traditional training approaches. They sound too rigid in terms of course offerings, are expensive for the trainee teachers, comprise overwhelming activities and do not fulfill the requirement of modern needs (Chandra, 2004). Changing scenario of teacher education and integration of ICT is likely to equip trainee teachers with the state-of-the-art instructional paradigm. Their approaches tend to be softer toward pedagogic practices both in and outside the classrooms. "Staff development topics of high demand include improving students' reading and writing skills, technology skills, working with inclusion students, working with diverse populations and active learning strategies" (Ornstein at al., 2010, p.40).

Majority of trainee teachers in their initial training know very little regarding use of technology in teaching and learning process and its effectiveness in instruction. It is also a fact that ccurrently more investment has been seen in ICT facilities and its usage in ICT as an important tool for teaching makes fundamental changes in teaching practices. It is yet to experience whether ICT can change the foundation of teaching methodology or it is a transition process for teachers (Beauchamp, 2006). Mentioning importance of ICT, the writer further describes that due to availability of technological aids, there are many changes in teaching learning process and these changing factors have larger impact on self-reliance by teacher educators, content, teaching methodologies, and students'

motivation including syllabus. Therefore, use of ICT in teacher education is effective and efficient way. While discussing on rationale behind use of ICT tools in teacher education designed for trainee teachers, Pelgrum (2001) emphasised that intergation of ICT in teacher education is inevitable, but success of any training program only is possible with qualified ICT-skilled teacher educators for professional development of trainee teachers.

Chandra (2004) supporting the idea of Pelgrum suggested that teacher educators must be highly skillful in use of ICT in classroom teaching and use of ICT tools for preparation of lesson plans for teacher trainees. It is important to highlight that the rationale behind use of ICT in teacher education is its effectiveness and efficiency. Use of ICT-supported teaching aids increase more chances for prospective teachers to utilize their capabilities for challenging tasks, enhance their self-learning, make them confident when they face teachers, take difficult tasks comfortably and work as an independent learner (Kennewwell at al, 2000). Moreover, the rationale behind use of ICT in teacher education is to face the challenges of 21st century. In addition, it is very important to incorporate use of information and communication technology in teacher education courses to maximize learning achievements and achieve educational objectives.

2.11. Competencies for ICT-Supported Teaching

Skinner (2010) highlights that for the improvement of learning and teaching process, ICT has potential to improve the learning and teaching by using different technologies. However, interest in the application of ICT must be increased by teacher educators so that they could learn more as compared to the contemporary students (Kennewwell at al, 2000).

45

Rickards (2003 draws picture of skills required in 21st centrury. He comments that:

> A successful future in education and the later life of our teachers and students is not about having the latest, fastest or most impressive technology; it is about making of most effective use of what you have and what is reality available to you. This is independent of technology as it is a personal attribute in students and teachers and so can operate in technology rich environments just as well as it can in no technology environments. (p.120)

Digital knowledge and computer skills must be known by teacher educators, but there should be practical approach for use of that knowledge and skills that should be the worth of teachers (Monteith, 2004). The teacher educators have to facilitate the trainees for their learning achievements. Teacher educators make difference in learning achievements of student by using ICT-supported teaching methodologies (Boakye & Banini, 2008). The improtance of ICT is that it is built-in nature of responsiveness and is capable of providing feedback which supports teacher trainees and motivates them to seek guidance from teacher educators (Whitebread, 2006). According to Diaz-Maggioli (2004),teacher educators are not noly managing class, but they work as counselers, managers and role models as professional. Therefore, they should be highly skilled in use of ICT according to the ICT Teacher Competency Standards of UNESCO (detailed are placed at APPENDIX I).

It is important to note that initial training is a phase when trainee teachers are prepared through ICT- enriched teaching methodologies (Tomei, 2009) and when

46

teachers are skilled in ICT supported teaching, teacher education enhances proficiency in knowledge, skills, capabilities, understanding, professional commitment, character and social values (GTC Scotland, 2006).

2.12. ICT and Lifelong Learning

The machine instructions provide chances to students to learn and discover knowledge about the topic in accordance with the specific requirement (Locates, & Atkinson, 1984). With the use of technology in education and training, a new concept of lifelong learning is emerged which has replaced old one (Forsyth,1996). The effective use of ICT in learning process promotes cognitive skills and lifelong learning at higher education level which plays important role for job working environment (Boakye & Banini, 2008).

Brindley (2001) stated:

> The new literacy however cannot be contained in the same way. There clearly
> exists a need to reconsider literacy as an ongoing development referred to earlier
> lifelong literacy. The acquisition of the new literacy cannot be picked off at
> eleven. Instead, while acknowledging the need for basic extended and advanced
> literacy skills, reflecting changes made in reading and writing demands through
> ICT. (Brindley, 2001, p.16)

The indigenous interpretation of literacy covers aspects to read, write and capabilities to communicate effectively, but the new concept of literacy is known as digital literacy which is through different electronic media, graphs, illustration, computer graphics and hypertexts. These are used in teaching learning process using ICT in

47

education (Millwood, 2001). Bryderup, Larson, & Quisgaar (2009) pointed out that "Students seem to be using ICT related to activities within the lifelong learning paradigm, which speaks in favour of ICT having a positive relation to the development of a lifelong learning paradigm" (p.375). Experiences with integration of information and communication technology in instruction are lifelong learning (Watson, 2006).

2.13. Integration of ICT and Learning Outcomes

UNESCO (2007) in pocket guide for ICT-enabled learning recognizing significance of integration of ICT in teaching methodology stated:

> Internet and web technologies offer a remarkable medium for a new learning framework that could dominate education in the twenty-first century..... The value of face-to-face interaction is acknowledged. The fact that ICTs make possible a new learning model should be seen as a massive opportunity of which educators and administrators can take advantage rather than position these technological and pedagogical developments as either/or options. (p.1)

Locates, & Atkinson (1984) have classified instructional media into seven sections which are computers, auditory tools, video tools, graphic media, published media, pictorial and simulation of games. Even inclination to use technology has great importance. Students' inclination to get more knowledge about the usage and functions of ICT leads to ultimate learning process (Kennewwel at al., 2000).

ICT-supported instructions provide opportunity for creative learning and innovative teaching methodologies enable learning. Applying ICT- enriched teaching,

48

teacher educators easily facilitate and enhance learning of trainee teachers in different characteristics. According to Frykholm & Meyer (1999), trainee teachers during their initial training are at critical phase of life which is shift from student to become a professional teacher and determination of option. As argued by Volman (2005) "ICT also provides opportunities for more authentic learning" (p.16).

Applying learning theory of constructivism, teacher educators can use information and communication teachnology as a resource not as an end in a conventional teaching methodology to achieve learning objectives (Teo et al., 2008). ICT-enriched learning strategy was discussed by Law, Yuen, & Fox in 2011 (as cited in Kampylis, Bocconi, & Punie, 2012, p.9), The study encompasses emergent characteristics of ICT-supported pedagogical aspects. It includes conducting ecological study on learning outcomes, teachers, role of learners, integration of ICT, connectivity and diversity of learning results. The study explained range of innovations from conventional to developing and concluded that advancement of technology and ICT- enriched teaching methodologies enable innovative learning outcomes for trainee teachers (Kampylis, Bocconi, & Punie, 2012).

2.14. Role of ICT in administration and management

Information and Communication Technology plays a vital role in supporting powerful, efficient management and administration in education sector. The importance of ICT in educational management and administration is the dynamics of organizations (Senge, 1990). It is specified that technology can be used right from student administration to various resource administration in an education institution. In 21st century the

contribution of ICT in management is very significant (Gay, Mahon, Devonish, Alleyne, & Alleyne, 2006). The increasing role of ICT has reshaped way and procedures of educational management system. The advancement of ICT, with cost effective technology in teaching, learning, administrative and management activities, is leading comprehensive administrative and management systems for the promotion of education with improved efficiency (Krishnaveni & Meenakumari, 2010). The effective ICT supported educational management system for administrators, teachers can not only improve the quality of education but it can bring economic transformation and sustainability. Educational managers need efficient and effective management of training activities with the use of ICT tools and management system (Adedapo, 2007). In addition, ICT in planning and management have changed the organizational structure applying technological tools and system for effective productivity (Lauerma, 2000).

2.15. Role of Teacher and Integration of ICTs in Teaching

The role of teacher is now as good facilitators. Therefore, he has to provide a conducive environment for students to find out the solutions according to their own observation using technological resources (Savery & Duffy, 1995). The teacher is a troubleshooter for the learner when there is problem in content knowledge. Therefore, his role is vital as compared to self-obtained knowledge using machine (Ram, 2007). The role of the teacher is changed, but the traditional role cannot be undermined. However, with advancemnt of technology, role of teacher is reshaped. Besides his tradional role, he plays a role of facilitator and using ICT tools coordinates closely with pupil to enbale effective learning environment (Forsyth,1996).

Yadav (2006) indicates that technology integration need changes to teachers' instructional roles in the classroom. He comments, "The teachers' role in a technology-infused classroom often shifts to that of a facilitator or coach rather than a lecturer."(p.32) and "teachers really are educational designers" (Volman, 2005, p.26). Educational process for delivery has been changed due to integration of ICT in teaching methodology (Sharma, 2009).

In the traditional role, the teacher was directing, but after integration of ICT in teaching methodology using various tools, the teacher is facilitating and monitoring activities of students (Wheeler, 2001). It is wrong to say that the role of teachers is not required after ICT-supported instruction, but it further enhances the role of the teacher. It is very important to provide evidence regarding use of ICT as fun and interesting for teachers and students. It is important to note that "Electronic communication is a powerful tool that can be used easily and effectively" (Easingwood, 2001, p.56), but role of a teacher cannot be ruled out from it. According to Kalogiannakis (2010), ICT-enriched innovations ehnace quality of education in which teacher plays a vital role in delivery.

2.16. Overview of the Pakistani education and teacher training systems

The education system in Pakistan, under current conditions, still faces many challenges and it is still a long way from achieving Universal Primary Enrolment (UPE). According to the UNESCO report:

The average enrolment per grade at the middle elementary level is less than one-half the average enrolment per grade at the primary level. This is considerably less

than that of most other countries, and it is clear that the delivery system needs to

significantly increase the proportion of students capable of studying beyond the

primary level (UNESCO, 2007, P.7).

According to Pakistan Social and Living Standards Measurement Survey (2011-12)

the Gross Enrolment Rate for primary schools is 91% percent. The Net Enrolment Rate

in public, private and also Deeni madaris is 57% percent which is substantially lower

than the Gross Enrolment Rate because of the enrolment of overage children in primary

schools. The Gross Enrolment Rate for middle level is 56% whereas the Net Enrolment

Rate 22%. The Matric Level (grade 9 & 10) Gross Enrolment Rate is 60% percent and

Net Enrolment Rate is 13%. The literacy rate for population 10 years and above remains

stagnant at 58% (Government of Pakistan, 2011).

For teacher education, there are 90 Colleges of Elementary Education which were

offering teachers' training programs for Primary Teaching Certificate (PTC) and

Certificate in Teaching (CT) to primary school teachers but from 2010, Associate Degree

in Education and four year B.Ed have been started in these colleges. For secondary

school teachers, there are 16 Colleges of Education, offering graduate degrees in

education and there are departments of education in 9 universities which train teachers at

the master's level. There are only 4 institutions which offer in-service teachers' training.

Besides these, the Allama Iqbal Open University, Islamabad, offers a very comprehensive

teachers' training program based on distance learning.

2.17.   History of Integration of ICT in Educational Policies in Pakistan

Pakistan has long history of using technology in education since last two decades starting form introduction of computer studies at high school level. In 2003, about 200,000 computers were provided to schools and different projects were initiated to improve computer literacy with the support of public private partnership (Perraton, 2012). National education policies and education sector plans much talk about use of ICT in education. Use of ICT in education was envisaged in "National Education Policy 1998–2010, the Education for All—National Plan of Action (NPA) (2001–2015) and the Education Sector Reforms (ESR) (2002–2006)". In 2004, ministry of education initiated the process to develop "National Information and Communications Technology Strategy for Education in Pakistan with the support of USAID under the Education Sector Reform Assistance (ESRA) Program, facilitated this overall effort (Ministry of Education, 2006). New initiatives and commitment by government of Pakistan is very important to develop policy guidelines for the integration of ICT-enriched initiatives to achieve the educational objectives (Cox, & Marshal, 2007). Teacher education in Pakistan has been neglected and there is need to launch new programs for the improvement of prospective teacher to modernize the teaching methodoloies in teacher training institutions. Institutional reforms are reuired to evaluate the existing ICT- supported policies for the improvement of educational achievements (Pelgrum, 2001). Study conducted by Looi, & David Hung (2004) proposed that it is important for Asian countries to equip the institutions with the infrastructure and learning resource material. Highlighting the facts the study mentioned that vacant teaching posts and untrained teachers both affect the quality of education

provided to Pakistan's youth (Lynd ,2007). The implementation gap can be visualized

from the following statement provided in the national education policy.

The implementation gap, though less well documented, is believed to be more

pervasive in that it affects many aspects of governance and the allocation and use

of resources. One piece of evidence relates to the amount of developmental funds

allocated to the sector that remains unspent. Estimates range from 20% to 30% of

allocated funds remaining unutilized. The underlying causes may lie in the lack of

a planning culture, planning capacity and weaknesses in the accountability

mechanisms (Government of Pakistan, 2009, p.15)

It is very important to note that information and communication technology has

not been properly implemented in teacher education program. Prospective teachers are

foundation stone of education system. "Let us not forget that the major share of the

responsibility in this connection will rest squarely with the country's leaders,

policymakers, and opinion leaders" (UNESCO, 2006, p.18).

National Education policy highlights the poor quality of teachers in public institutions

and stated "Poor quality of teachers in the system in large numbers is owed to the

mutations in governance, an obsolete pre-service training structure and a less than

adequate in-service training regime" (Ministry of Education, 2009, p.42). In addition, in

the policy action, it is emphasized that in the light of National Information and

Communication Technology (NICT), Strategy for Education in Pakistan, use of ICTs

54

must be ensured in teacher education to improve quality of teachers. NICT strategy comprises following six elements:

1. Use of ICT to extend the reach of educational opportunity

2. Apply ICT to strengthen the quality of teaching and educational management

3. Employ ICT to enhance student learning

4. Develop complementary approaches to using ICT in education

5. Build on the current experiences of existing and successful ICT programs

6. Develop capacity at the federal and provincial department of education levels

(Ministry of Education, 2008, p.1)

Advancement of information and communication technologies has compelled to reshape traditional teaching methodologies. Teacher educators have to plan carefully what to teach and how to teach. Using ICT in training, teacher educators have to select appropriate tools, change classroom environment and achieve learning objectives and enhance students' learning outcomes (Fluck, 2008). It is therefore necessary to revisit pre-service training and support should be provided to teacher educators to develop instructional models to improve teacher education in government colleges of education where teachers start their career during pre-service training program.

New initiatives and commitment by government is very important to develop policy guidelines for integration of ICT-enriched initiatives to achieve education objectives (Cox, & Marshal, 2007). Teacher education in Pakistan has been neglected and there is need to launch new programs for the improvement of teacher to modernize teaching methodoloies in teacher training institutions. Institutional reforms are reuired to

55

evaluate the existing ICT- supported policies for the betterment of educational achivements (Pelgrum, 2001).

The existing curiculla of B.Ed one year teacher education program do not possess any formal integration of ICT but many in-service programs have been offered from time to time to improve computer literacy of teacher educators. Recently, with the support of USAID under PRE-STEP education project, in colloboration with higher education commission. Introduction of information and communication technology has been included in the new curriculum of two years ADE program and four years B.Ed.

Study conducted by Looi, & David Hung (2004) argued that "from the various ICT efforts in the Asian context, we have observed the phenomena of diminishing traditional divides such as the digital divide due to ICT developments" (p.38) and in the same study proposed that "a comprehensive policy for ICT in education needs to consider several key success factors: infrastructure, content and learning resources, teacher training, curriculum, and assessment and evaluation" (p.38). Policy level descions have been taken by Government of Pakistan. Keepining in view significance and importance of ICT in teacher education, policy document stated to use ICT to show teachers ways to move away from the whole-class lecture mode towards more active, student-centered methods of learning. Teachers can utilize ICT tools in making learning an engaging, motivating experience for students. An ICT-rich environment can provide more independent and collaborative, team-based learning in which students assume greater initiative and responsibility (Ministry of Education, 2006, p.14).

UNESCO in the Education System in Pakistan stated that " vacant teaching posts and untrained teachers both affect the quality of education provided to Pakistan's youth"(Lynd ,2007, p.8).

2.18.   Rationale of ICT model

It has been observed that model approach support teachers in teaching and learning process. ICT-supported teaching strategies provide new experience, help to understand different concepts, provide teacher educator opportunity to evaluate and strengthen professional skill in accordance with requirement of students. (Baron, & Harrari, 2005). A great challenge is to understand that "the worldviews, beliefs, and prior conceptions of students cannot be ignored, but must be addressed explicitly and openly" (Smith, 2010, p.561). Easingwood (2001) conducted a study on integration of ICT and its role in teaching and learning process. He enumerates ICTs in four Es and describes that use of ICT is:

E1: eases and supports the task,

E2: enables the learner,

E3: ensures that the learning outcome can be achieved and

E4: enhances the tasks quality and value. (Easingwood, 2001, p.46)

Teacher educators have to be knowledgeable about the perception of students regarding learning achievements and impact on learning (Cicciarelli, 2009). Information and communication technology provides supportive environment for teaching and learning. Yadav (2006) suggests that it is necessary to understand applications of ICT which are major sources of learning achievements. It is a great challenge for teacher

57

educators because "educators must travel through a number of stages (entry, adoption, adaptation, appropriation, invention or innovation) to intense technology successfully into their classrooms and their teaching programs to change the learning environment" (Trinidad, 2003, p.100).

Discussing possibilities and challenges, Livingston, & Condie (2006) stated:

> However, teachers need to recognize that e-learning is different from traditional practice, acknowledge the student's ability to manage her or his own learning, and provide a foundation in terms of skills and attitudes for future learning beyond school. A new level of training and ongoing support is needed for teachers to achieve this. Training programs must look beyond providing teachers with the technical skills required to use ICT and focus on helping them to explore how technology can transform the teaching and learning process and radically change the roles of teachers and students in the classroom. (Livingston, & Condie ,2006, p.157)

2.19. Study of previous ICT model

2.19.1. Model 1: A model for initial teacher ICT training

Fluck (2008) discussing in "a model for initial teacher ICT training", as given below, emphasis that it is difficult for teachers to be confident to support students in coherent manner, therefore, model approach is very imprtant to encourggae teaching and learning process in systematic way.

58

A model of professional development for teachers using information technologies in education (ITIE).

This model can support student learning outcomes based upon the Key Information Technology Outcomes (KITOs).

(PRIVATE)	Personal and Professional Focus	Teaching and Learning Focus	Management and Organisational Focus
CORE MODULES KITO mode	**P1 Operating Skills** Switch on the computer. Input, process, and output(print) information. Identify hardware, software and liveware. Fix simple faults. Copy, cut & paste: text, pictures, movies, active objects within and between applications.	**T1 Software Evaluation** Can identify software and its source. Matches digitised resources with teaching and learning needs. Makes judgements about software usability for student learning.	**M1 Pedagogy** Examine how different approaches to teaching and learning affect the selection and use of electronic technologies. Explore the effects of electronic technologies in terms of theories for curriculum development, teaching methodologies, learning processes and assessment strategies.
Publishing	**P2** Produce paper-based learning materials. Create a web page. Develop multi-media presentations.	**T2** Develop student self-confidence and accuracy through presentation tools, word processors, graphics and CADD packages to access, extend, transform and share ideas and information.	**M2 Planning** Prepare strategic plans for the application of electronic technologies for educational purposes. Identify, encourage and support change agents within the school, and incorporate the community in change processes. Network management and security. Legal requirements (health and safety, privacy, copyright etc).
Communicating	**P3** Send and receive e-mail. Participate in desk-top video-conferencing. Initiate on-line dialogue through IRC etc. Participates interactively using telnet and MOO-type clients.	**T3** Identify and use e-mail based learning resources for his/her students. State appropriate rules of netiquette. Examine the social and political implications of ITIE. Use ITIE to participate in co-operative and collaborative investigations and undertake shared tasks.	
Researching	**P4** Search CD-ROM based information sources. Use web and intranet search engines effectively. Create a personal file of bookmarks. Set up and use a student records database.	**T4** Enable students to access information from a variety of sources, and to think critically about their veracity, credibility, distortions and self-developmental effects. Also enable students to synthesise researched information and ideas into new concepts and practices.	
Problem Solving	**P5** Set up a simulation of a local situation using a modelling, spreadsheet or analysis package and use it to predict future events. Display factors using imaging software. Collect and analyse data from the real-world.	**T5** Encourage students to explore the consequences of theories and practices using simulation and modelling software. Enhance models with data from the real world. Guide them to apply these techniques to existing information and projected scenarios. Students determine the action of a programmable device (such as an electronic toy or LOGO turtle).	**M3 Infrastructure** Integrate electronic technologies into teaching and learning across the curriculum (so they become transparent). Organise software resources on computers and servers. Allocate dataspace to members of the learning community. Organise teaching spaces to use information technology effectively. Arrange for technical support and maintenance as required.
Independent Learning	**P6** Manage an independent learning system. Create content for framework software such as expert shells. Create inter-active multi-media tutorials.	**T6** Facilitate independent student learning using computerised teaching packages such as drill and practice, tutorials etc. Use diagnostic software to assist in the determination of student learning needs. Use generic tools to transfer learning to different contexts and situations.	

Figure 1. A Model for Initial Teacher ICT training

Sources: Fluck, E. A. (2008). *A model for initial teacher ICT training.* Retrieved from http:www.educ.utas.edu.au/users/afluck/publish/paper08.pdf

2.19.2. Model 2: A generic model for guiding the integration of ICT

The generic model proposed by Qiyun Wang as given below emphasises on pedagogy, social interaction and technology as three main important elements for the guidance of teacher which hepls them to integrate ICT in teaching and learning process. He further concludes that pedagogy is a continuous process therefore, content must create learning environment to fulfill the needs and learning requirement of students. However, social interaction, as an important part of life, should be flexible to solve the problems of students and ICT supported teaching and learning process will provide opportunity for collaborative working environment to solve the problems (Wang, 2008)..
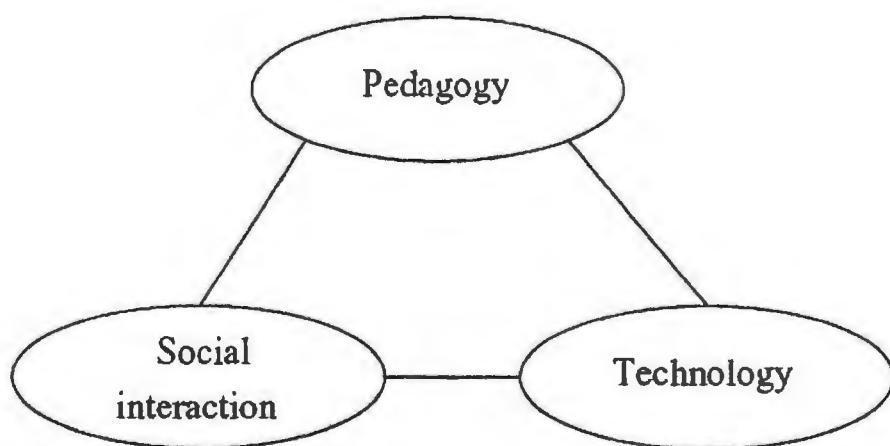
Key components of the generic model.

Figure 2. A Generic model for guiding the integration of ICT

Sources: Wang, Q. (2008). A generic model for guiding the integration of ICT into teaching and learning. *Innovations in Education and Teaching International* *45*(4) , 411-419.doi: 10.1080/14703290802377307

2.19.3. Model 3: A generic ICT-enhanced Teacher Development Model

Engida (2011) supporting the views of Angeli and Valanides (2009) about the shortcomings of Technological pedagogical content knowledge (TPCK) framework considers that TPCK cannot support teachers to manage teaching and learning situations form TPCK point of view. He presents ' ICT enhanced teacher development (ICTeTD) model' as given below and argues that;

> TK (technological knowledge) and PK (pedagogical knowledge) are in the plane of the page whereas CK (content knowledge) is outward (towards the reader) of this page. All the three knowledge areas are at the same level of (have equal importance to) forming the pyramid. The pyramid is made of 'fleshes' of TPCK (technological pedagogical content knowledge), a transformed knowledge through proper interactions of CK, PK and TK (Endiga, 2011, p. 19).
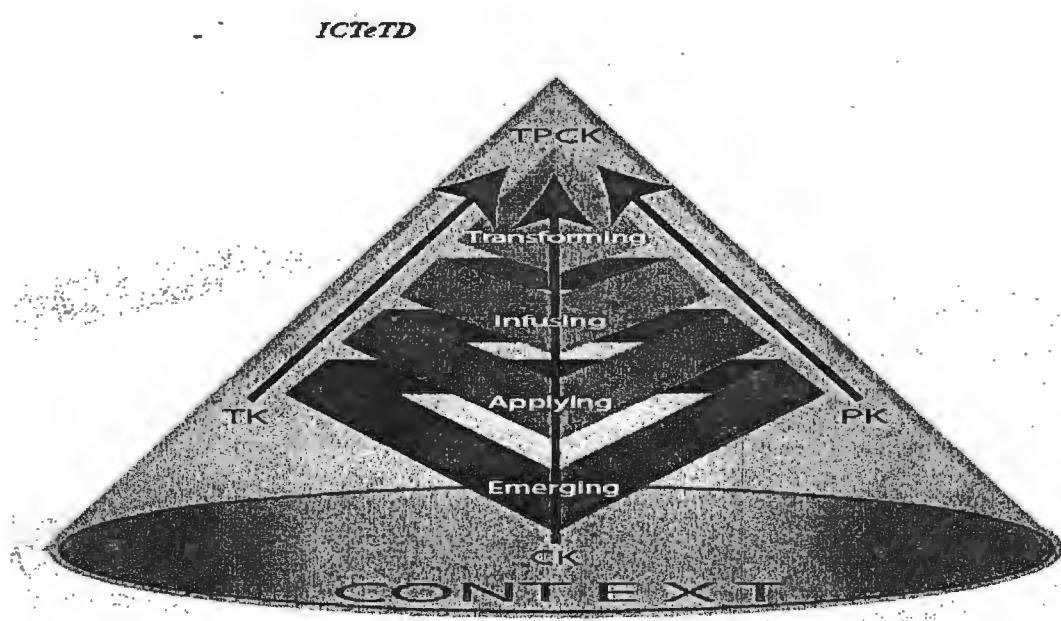
Figure 3. The ICT-enhanced teacher development model

2.2. The Concept of ICT Model

To strike a balance between theory and practice is a long standing challenge in the pre-service teacher education programs (Korthagen, 1996, Bates, 2002, Smith, 2006). Development of ICT-supported models provides direction and enhances professional development (Gilbert, 2001). Teaching models provide academic support to teacher education because " much of the teachers' time is used in bureaucratic and managerial tasks" (Stephen, 2006, p.177). Richards (2005) investigated the importance and significance of ICT-supported teaching models for improvement of learning, learning, impacts and outcome while using ICTs in teacher education. He stated:

> To more effectively harness the exciting education implication and learner-centered possibilities of ICT, teachers need (a) new design strategies for teaching and learning which promote the applied integration of ICT, and (b) to avoid the kind of add-on tendencies associated with still dominant assumptions about formal lesson planning and syllabus design on one hand are often in advertent in the use of top-down models such as instructional design and social constructivism theory...use of practical design models (a) provide a useful focus in teacher education for encouraging teachers to become more active and innovative" designers" of ICT-supported learning in the digital age, and (b) indicate the generic structure or anatomy of an effective ICT-supported learning activity.

Practical activity –based learning with ICTs that provides pretexts for more
effective curriculum learning and reflective practice exemplify a diagonal
approach to educational design...The dialogical stage of *native, critical*, and
applied learning represents a framework for not only linking educational content
and process and also learner thinking and doing, but very transformations which
exemplify ICT literacy transition from mere competency to applied
understanding, knowledge and innovation. (p.75)

The purpose of ICT-supported Teacher Training Model (ITTM) is to use tools of
technology in instruction which covers use of ICT in teaching, ICT-supported lesson
planning and ICT-supported instructional methodology. Kennewwell, Parkinson, &
Tanner (2000) pointed out that those teachers who are using ICTs in their teaching are
always of the opinion that ICT must be used by non-users so that they could improve
skills and knowledge of teaching.

The proposed model provides complete frame work to the teacher educators for
their ICT- supported training. It is expected that ICT-supported Teacher training model
will provide basis for pre-service teacher education programs offered by elementary
colleges of education for the preparation of primary school teachers. The ITTM deals
with the understanding about the ICT-supported instruction and role of teacher education
in 21st century.

2.3. Rationale in ICT-supported Proposed Model

The advancement of technology and its integration in education has changed the
teaching methodology. Students are not an empty vessel in which teacher has to fill with

the passive knowledge. The training program for trainee teachers are designed for enhancement of knowledge, skills required and responsiveness to the modern challenges (Pulist, 2010). The role of teacher is changed and he is now a facilitator who supports students to enhance and evaluate their knowledge, understanding and learning. The important characteristics of modern teaching methodology are (a) prepare trainee teachers, (b) guide trainee teachers, and enhance professional development trainee teachers (Kochhar, 2008). Study conducted by Looi, & David Hung (2004) argued that "from the various ICT efforts in the Asian context, we have observed the phenomena of diminishing traditional divides such as the digital divide due to ICT developments" (p.38) and in the same study he proposed that "a comprehensive policy for ICT in education needs to consider several key success factors: infrastructure, content and learning resources, teacher training, curriculum, and assessment and evaluation"(p.38) In this situation ICT-supported teaching methodology provides opportunity to the students for high-order thinking and learning. Policy level decesions have been taken by the Government of Pakistan. Keepining in view significance and improtnace of ICT in teacher education, policy document stated;

> Use ICT to show teachers ways to move away from the whole-class lecture mode towards more active, student-centered methods of learning. Teachers can utilize ICT tools in making learning an engaging, motivating experience for students. An ICT-rich environment can provide more independent and collaborative, team-based learning in which students assume greater initiative and responsibility (Ministry of Education, 2006, p.14).

An ICT-supported classroom is dynamic classroom with varying view of world and flexibility to explore the new concept. Mumtaz (2000) argued that "teachers need to be given the evidence that ICT can make their lessons more interesting, easier, more fun for them and their pupils, more enjoyable and more motivating" (p.338). According to Pakistan Education statistics (2009) there are 1.31 million in-service teachers and more than 60% of them are untrained or have only basic training at Primary Teaching Certificate (PTC) and Certificate of Teaching (CT) levels. The majority of them are teaching at primary school level in rural areas. The process of professional training, preparation and development of teachers is neither consistent nor responsive to changing needs of the society. The National Education Policy (2009) stressed on reforms in pre-service training and preparation, and standardization of professional qualification to increase the efficiency and raise the quality.

The traditional pre-service teacher education programs are failing in preparing teachers for effective teaching and learning in the classroom (Korthagen & Kessels, 1999). Pre-service teacher training is unable to fulfill the needs of education system so it is facing criticism from different stakeholders. At the same time a dominated view is emerging that theory and practice should be integrated (Leinhardt, Young, & Merriam, 1995). The existing gap between theory and practice in pre-service teacher education is a matter of concern for stakeholders and efforts are being made to bridge this gap (Westbury & Hansén, 2005). With the passage of time the institutional and societal demand for bridging the gap between theory and practice is rising.

Due to the non-alignment between theory and practice, when newly trained teachers enter into teaching profession, they find it hard to link what they had acquired during their professional training and what knowledge and competencies are being demanded by the profession. Such teachers consider academic knowledge and practice as being neither practicable not credible, so they prefer to rely more on personal experiments and experiences, and of their colleagues (Gore &Gitlin, 2004). The research studies on teacher education called for qualitative improvement of professional preparation of pre-service and in-service teachers in Pakistan through reforms in curricula, improved quality of instruction, aligning acquired, required and applied teaching skills(Pre-STEP, 2010)..

2.4. Theoretical Foundations of Proposed Model

A diverse trainee teacher learners' classroom with diverse background may be a great challenge for teacher educators. The learners with different academic background and capabilities pose specific challenges for teacher educator. The aim of teacher educator is to facilitate trainees for learning outcomes. Therefore, it is prime responsibility of teacher educator to transform information and knowledge to trainee teacher (Forsyth,1996). ICT-supported teaching strategies provide new experience, help to understand different concepts, provide teacher educator opportunity to evaluate and strengthen professional skills in accordance with requirements of students. (Baron, & Harrari, 2005). To deal with the above mentioned problem, the view of constructivism plays a leading theoretical role to achieve the goals of education. Constructivism is a way of high order thinking and learning which apply following approach to explore students' understanding and enhance it to higher level thinking. According to constructive theory:

1. Teachers should know the existing knowledge of students,

2. Teachers should take into account to build on this knowledge and

3. Teachers should provide opportunity to students' to apply knowledge into practice.

The most important variations of constructivism are personal constructivism and social constructivism. Personal constructivist approach is associated with Piaget with emphasis on learning as a discovery and social constructivism was attributed to Vygotsky considering social interaction, instead of social individual construction, cognitive development as a primary function. Defining the two important notions of constructed knowledge, Mvududu & Burgess(2012) stated that:

The first is that learners construct new understandings using what they already know. They come to learning situations with knowledge gained from previous experiences. That prior knowledge influences what new or modified knowledge they will construct from the new learning experiences....the second. Learners negotiate their understanding in light of what they encounter in the new learning situation. If what learners encounter is inconsistent with their current understanding, their understanding can change to accommodate new experience. (p.110)

Most of education reformers argue that constructivism approach, particularly integrating ICT, may develop high order thinking skills and provide opportunity to reform the instructional methodology which may fulfill the needs of 21st century.

Pelgrum & Law (2003) mentioning rationale on the relationship between ICT and education stated:

1. In the knowledge society, the half-life of knowledge will become progressively shorter;

2. Due to growing specialization of knowledge, it will be increasingly necessary to work in teams;

3. Citizens need to be prepared for lifelong learning and be introduced to the basics of team-and project-work as part of basic education;

4. Educational innovations in basic education are necessary if these new demands are to be met, and such innovations should have a strong pedagogical focus on student-centered and increasingly student-directed didactical approaches facilitated by ICT, whereby teachers should play more of a coaching role. (p.20-21)

2.5. ICT-supported Proposed Model

ICT- supported solutions have manifold functions for learning outcomes which enable learning achievements (Rickards, 2003). Supporting the innovative nature of ICT, Jung (2005) affirmed that "selecting appropriate ICT tools and supporting students in the use of those tools, using ICT to promote learning activities, developing new methods of facilitating learning and evaluating student performance, and so on" (p.95). The difference between traditional classroom and constructivist classroom is shown in chart below.

The chart compares the traditional classroom to the constructivist one. One can see considerable distinction regarding the knowledge and learning.

(Balanskat, Blamire, & Kefala (2006) in the European School Net in the ICT Impact Report: A review of studies of ICT impact on schools in Europe, has classified following innovations with the integration of ICT ion teaching:

Table 3. Difference between ICT supported teaching and traditional teaching

Area	ICT-based teaching	Traditional teaching
Approach	Constructive (and instructive)	instructive
Teaching	Project-based teaching	Pre-programmed teaching
Training plan	Based on themes	Subject focus- based on a firm outline and standards
Tasks	Must be fulfilled- individual and collective	Having particular knowledge – everybody does the same
Learning	Understand the context	Memorizing facts
Pupils	Divided by skills and interests- differentiation	Divided by age
Evaluation	Mistakes are source for improvement and guidance Oral feedback Formative research	Correction only Marks and grading as part of the evaluation of students
Teacher	guide and mediator has several roles	high authority has one role
School	open environment	closed environment

Source of information	Multiple	Teacher

Sources: The ICT Impact Report: A review of studies of ICT impact on schools in Europe (p.45)

Trainee teachers can be trained through ICT-supported teaching strategies in subject area. Teacher educators can easily manage trainee-centered learning method using ICT tools (Goktas, Yildirim, & Yildirim, 2008).

2.6. Summary of chapter

The review of literature helped the researcher to have background information regarding use of ICT and current trends in integration of ICT in teacher education programs. The basic information about ICT, its usage in education and impact of integration of ICT in teacher education programs provided a lot of knowledge which supported the researcher during the development of ICT-supported model for teacher education program. A compressive information on ICT and challenges in 21st century revealed several aspects of use of technology in education.

The literature on difference between traditional education system and emerging ICT-supported paradigm in the field of teacher education enriched the knowledge of the researcher. The role of ICT in teaching and learning process and as an emerging medium of instruction helped the researcher to understand the new trends and development of new pedagogical approaches about teaching approaches around the globe. The literature on impact of use of ICT on learning outcomes helped the researcher in discovering new trends emerging in learning theories.

CHAPTER THREE

Research Methodology

This chapter presents the discussion on methodology of study and its research design, procedure of data collection, population and sampling, selection of participants for research, collection of data, analysis of data and validity and reliability of this study. The purpose of this research was to answer the questions of this study (section 1.2). This chapter also covers the particular instruments selected for the research, data collection tools including management of data and data analysis. Ethical considerations and data collection strategies have been discussed in this chapter.

3.1.   Research Design

The mixed method approach was chosen by researcher as an appropriate in the context of this study. Mixed method is combination of both qualitative method and quantitative method to answer the research questions of single study (Mertens, 2005). Historically, combination of quantitative and qualitative research design is most popular amongst the researchers in the field of social sciences. To answer the research questions and keeping in view the objectives of the study concurrent triangulation strategy approach was used. Creswell (2009) defines qualitative and quantitative research as "the process of research involves emerging questions and procedures, data typically collected in the participant's setting" and " a means for testing objective theories by examining the relationship among variables" (p.4). Both quantitative and qualitative research methods

were used for the analysis of data and inferences through questionnaires, focus group discussions and classroom observations respectively.

Quantitative approach was chosen to investigate the research questions of the study whereas qualitative instruments, focus group discussions and classroom observation were used to collect the data for this study to obtain qualitative input from the research institutions. This approach provided triangulation. According to Creswell (2009) triangulation is "a means for seeking convergence across qualitative and quantitative methods" (p.14).

The reasons for selecting the mixed method approach were because (i) both qualitative and quantitative methods offer in-depth insight to investigate the research questions for this study, (ii) any single method, qualitative or quantitative have chance of biasness with limited result as inherited in the research design, (iii) the mixed method approach enhances the generalization of results as compared to single research method either qualitative or quantitative. "Mixed method research is an approach to inquiry that combines both qualitative and quantitative forms". (Creswell, 2009, p.4)

The questions of this study were required to answer how teacher educators use ICT in teaching methodology to prepare the initial teacher trainees in government collages of education. Therefore, to avoid biases in single research method combination of qualitative and quantitative methods was used to investigate the social phenomenon that converge the results with the enhancement of validity (Greene, Caracelli, & Graham, 1989).

72

3.2.   Population

All the institutions were included in this study that was offering one year B.Ed in Sindh province. The first population of study was teacher educators. The census sample was used for teacher educators to collect the data. All the teacher educators of B.Ed class were selected from all four colleges of education out of which two colleges were located at Karachi, the capital city of Sindh province, one was in Sukkur district located in the southern part of Sindh province and PITE that was located in district Shaheed Benazirabad. Convenience sampling method was used to collect the qualitative data. For focus group discussion, Government College of education Sukkur and PITE were selected through purposeful sampling method using criterion technique of (i) teacher educators who were teaching B.Ed classes, (ii) have more than two years of experience in college of education, particularly have taught B.Ed class, (iii) have acquired basic training or diploma in IT, and (iv) have skills of computer usage and experience in ICT tools in teaching. In Sukkur College of Education, 17 teacher educators of B.Ed classes participated in two focus group interviews and 9 teacher educators from PITE participated in one focus group interviews.

The second population of the study was B.Ed trainees. B.Ed trainees were selected through random sampling approach. 50% of the B.Ed trainees were selected from all four colleges of education out of which two colleges were located in Karachi, the capital city of Sindh province, one was located in Sukkur district located in the southern part of Sindh province and PITE was located in district Benazirabad. 147 questionnaires were

73

responded by B.Ed trainees with the return rate of 42.98%. The major reason of low rate return remained absenteeism by B.Ed trainees. Head of institutions during interview explained that only 20% to 30% students attend the classes after registration. In Sindh province, absenteeism among the students has been common phenomenon in the educational institutions. The major in teacher education is high dropout rate, wide spread student teachers' absenteeism, shortage of trained and qualified teachers, lack of commitment of prospective teachers and interest in their profession (Shah, 2003).

The last population of study was head of institutions. The census sampling was used for heads of institutions to collect the data. All the Principals were selected from all three colleges of education out of which two colleges were located in Karachi, the capital city of Sindh province and one was located in Sukkur district located in the southern part of Sindh province. From PITE, an In-charge Academic & Administrative affair was the participant of the study. In total, 4 in-depth interviews were conducted. It consists of one participant from Government College of Education Sukkur, one from Government College of Education Jamia Millia Karachi, one Government College of Education F.B Area, Block NO. 15, Karachi and In-charge Academic & Administrative affairs from PITE.

3.3. Sample

The census sampling was used to collect the data from all the heads of the institutions and teacher educators. The researcher used simple random sampling techniques to collect the information from B.Ed trainees. For focus group discussions, out of four institutions, two intuitions; Government College of Education Sukkur and

74

PITE were selected. In total 03, focus group discussions were conducted with 28 teacher educators. The researcher used purposive and convenience sample methodology to collect the data. Table 4 shows the details of data collection through instruments used for this study.

Table 4. Summary of data collection using instruments of study

Questionnaires		
Participants of study	Questionnaire distributed	number of questionnaires filled
Teacher educators	47	37
B.Ed trainees	342	147
Focus group discussions		
Participants of study	focus group discussions	number of participants
Teacher educators	3	22
In-depth interviews		
Participants of study	interviews	number of participants
Head of institutions	4	4
Classroom observation		
Participants of study	Number of classroom observation	Number of participants
Teacher educators and B.Ed trainees	3	58 B.Ed trainees and 3 teacher educators

3.4. Development of Research Instruments

Both for the quantitative and qualitative data following instruments were used:

(1) The questionnaires

     i. Questionnaire 1 for teacher educators &.

     ii. Questionnaires 2 for B.Ed trainees

(2) Focus group discussions in two colleges and

(3) Classroom observations

(4) Interviews from head of institutions

Two questionnaires, one for teacher educators and second one for B.Ed trainees, were developed to collect the quantitative data from teacher educators and B.Ed trainees regarding different aspects of integration of ICT and access to ICT tools including use of ICT tools in teaching, and learning process.

For qualitative data gathering, Focus Group Discussion with teacher educators, and in-depth interview with heads of institutions were conducted. However, classroom observation form was another instrument which was used to observe the ICT-supported teaching practices in colleges of education and PITE Sindh. Open ended questions, in-depth interviews and classroom observation allowed collecting in-depth knowledge and information regarding the use of ICT in instruction. Using of multiple tools for data supported researcher for concurrent triangulation strategy of collected data which enhanced the validity and reliability of information.

Previous researches helped to design the questionnaires keeping in view the objectives of research study. First draft of research questionnaires was constructed and shared with the experts for revision. After observation and review, the data collection instruments were finalized. Each instrument used for the data collection of this study is discussed in detail as follows:

3.4.1. The Questionnaires

The tool of questionnaires were designed to collect the data regarding the facilities available in the institutions for ICT-supported teaching environment, use of ICT by teacher educators in teaching methodologies, competencies of teacher educators to use ICT, perception and willingness of teacher educators regarding use of ICT in teaching, facilities and support provided by administration for conducive ICT-supported teaching- learning environment , the current status of B.Ed students in use of ICT and their need analysis. Through questionnaires, the researcher explored the exiting use of ICT in teacher education in B.ED program offered by the government colleges of education and PITE. The current status of knowledge and information was represented in each item of questionnaires. Each question was designed in accordance with the guidelines to keep relevance of each question to the role of subject, concreteness, avoid biasness of words and its representation to one meaning (Fink & Kosecoff, 1998).

Introductory section of the questionnaires includes basic personal and professional information, i.e. age, academic qualification, professional qualification, IT courses, teaching experience, etc. In all questionnaires, basic information was accordingly obtained as applicable for teacher educators and B.Ed trainees. Section of

access to ICT tools covers information regarding the facilities available in the institution for teacher educators and B.Ed trainees. In this section, use of ICT's tools in teaching include usage of different technological instruments by teacher educators for instruction during classroom teaching and use of ICT by B.Ed trainees for preparing assignments and project preparation. Under the section of supportive environment and attitude towards use of ICTs as tools in teaching-learning process, questions were asked about ICT-supportive environment by administration, perception of teacher educators and B.Ed trainees regarding use of ICT in teaching and learning process, its importance and impact on learning achievement. In addition, this section also covers attitude and willingness of teacher educators to use ICT in their teaching methodologies. The questionnaires include questions to find out the ICT competencies of teacher educators, B.Ed trainees and competency deficiencies to use ICT in teaching learning process. Section wise details of questionnaires are given below:

3.1.1. Questionnaire 1 for Teacher Educators

This questionnaire was designed to collect the data from teacher educators of B.Ed class in three Government College of Education and PITE. The questionnaire for the teacher educators was divided into following five sections focusing different aspects regarding use of ICT, perception and willingness, as it can be seen at APPENDIX A.

- Section 1: Introductory Information
- Section 2: Access to ICT Tools
- Section 3: Use of ICT Tools in Teaching

78

- Section 4: Supportive Environment and Attitude towards use of ICT as Tools in

  Teaching-learning Process

  (a) The Capacity of Government Colleges of Education in terms of ICT

  (b) Teacher educators' ability to use ICT and practices of teacher educators

  regarding the use of ICT into teaching learning process

  (c) Teacher educators' perception about integration of ICT into their teaching

  learning process

- Section 5: Competencies in the use of ICTs as tools in teaching-learning process

The questionnaire was developed on the basis of review of literature. The section 2 of

questionnaire consisted of 13 items with 'yes' and 'no' options regarding access to ICT

tools available in college. Section 3 consisted of 11 multiple choice questions regarding

use of ICT tools in teaching and learning process. While questionnaire consisted of main

56 items, out of which 49 items comprised five-point Likert scale and 7 items comprised

open-ended questions.

The questionnaire was sent for the review and content validity to two experts in the

educational research domain. As per their feedback, it was modified for the internal

validity of the study. The questionnaire's pilot test was conducted in Government

College of Education Sukkur with 04 teacher educators. The Cronbach Alpha coefficient

was estimated. It was found with satisfactory reliability co-efficient of 0.87.

3.1.2. Questionnaire 2 for B. Ed Trainees

The second questionnaire was developed to collect the information from B. Ed

trainees who were registered in Government Colleges of Education in 2011 academic

79

sessions. This questionnaire was divided into the following five sections focusing access to ICT facilities available in the institution, usage of ICT facilities by B.Ed trainees and need analysis as it can be seen at APPENDIX B.

- Section 1: Introductory Information

- Section 2: Access to ICT Tools

- Section 3: Use of ICTs Tools in Teaching- learning Process

- Section 4: Supportive Environment and Attitude towards Use of ICTs as Tool in Teaching-learning Process

- Section 5: ICTs Needs of B.Ed Trainees

The questionnaire was developed on the basis of review of literature. The section 2 of questionnaire consisted 11 items with 'yes' and 'no' options regarding access to ICT tools available in college. Section 3 consisted of 10 multiple choice questions regarding use of ICT tools. While questionnaire consisted of main 40 items, out of which 38 items comprised five-point Likert scale and 7 items comprised open-ended questions.

The questionnaire was reviewed by the two experts. It was recommended that simple terms may be used instead of long phrases. According to their feedback, it was modified accordingly. The pilot test was conducted in Government College of education Sukkur with 16 B.Ed trainees due to less attendance of students. The Cronbach alpha coefficient estimated was found with satisfactory reliability co-efficient of 0.86.

3.1.3. Focus Group Discussion

Focus group discussion is very reliable, accurate and useful tool to collect the data in qualitative research. It is in-depth discussion with smaller homogeneous group facilitated by moderator. The researcher chose this tool to explore the perception, attitude, motivation and acceptance of integration ICT in teaching learning process and its impact on learning outcomes.

The purpose of these focus groups discussion was to collect the information regarding use of ICT in teacher education, its impact on learning achievements and problems faced by the teacher educators in use of ICT tools for instruction. Consent form was developed for the permission of the participants and their voluntary participation in research study. Following semi- structured questions were constructed to focus the discussion on topic:

1. What do you know about the Information and Communication Technology (ICT)?

2. How do you recognize the role of ICT in teacher education? What is your perception about integration of ICT?

3. Can you share the advantages and disadvantages of ICT in teaching?

4. Have you used ICT tools in teaching your subject? If yes, how frequently?

5. Why is integration of ICT important in teaching learning process?

6. What should be the ideal role of teacher in relation to ICT-supported instruction?

7. Do you feel role of teacher educator has changed with the use of ICT in teaching?

8. What are major challenges in use of ICT in teaching?

9. What would help most as a way forward with ICT?

3.1.4. Classroom Observation

Classroom observations in natural settings provided different characteristics of instruction in classroom and information base on teaching methodologies. Permission was obtained for classroom observation from head of institution and classroom teaching was observed in natural settings in Government College of education Sukkur. The purpose of classroom observation was to (i) find out the existing status of ICT-supported teaching and learning process, (ii) obtain comprehensive evidence regarding use of ICT in instructional methodologies, (iii) explore existing competencies of teacher educators and competency deficiencies in use of ICT, and (iv) identify needs of ICT-based instructional model for teacher educators.

3.1.5. In-Depth Interviews

Face to face interaction between researcher and participants through interview is the best tool to collect the qualitative data for study. Interviews help researcher to unfold the additional information regarding the subject of study. The researcher conducted semi-structured interviews with the heads of institutions in this study. The participants were reluctant to allow the recording of interview session, but they permitted to take the notes during interview. Open-ended questions were formulated before interview sessions. The interview sessions supported the researcher to collect the comprehensive information regarding administrative support provided by institutions and facilities by government including trainings in ICT.

3.2.   Pilot- testing of Questionnaires

Questionnaires were pre-tested to check the clear understanding of teacher educators and B.Ed trainees. In order to carry out pre-test, five teacher educators and five students were selected and respective questionnaires were passed for pilot test. The purpose of pilot test was to obtain information regarding correct understanding of items and different terms used in questionnaire. The pilot test was conducted in Government College of Education Sukkur which was representing the target group according to the objectives of study to check the reliability and validity. The result of pilot test showed that teacher educators and principals did not have any problems to comprehend the questions or information given in the questionnaire. In the case of B.Ed trainees, a few terms like spreadsheet, teaching learning environment and integration of ICT tools were not clearly understood by the two students due to inefficient computer literacy. Such terms were used to obtain the existing knowledge related to integration of ICT in educational instruction and its importance in teaching learning process. The outcome of pilot test was clear that all elements of questionnaire were easily understood and there was no ambiguity regarding questions and information to be elicited for the study. The pilot test was satisfactory except the few changes in terminology which were made accordingly. These participants of study were not included in the actual sample.

3.3.   Validity and Reliability of Questionnaires

Validity of research tools provides correct information about subject of study for right decision making (Jacobs & Chase, 1992). Reliability of instruments is concerned with the consistency (Jacobs & Chase, 1992). Cronbach Coefficient Alpha is very

popular method to estimate the reliability which is based on consistency, constancy and uniformity. Coefficient of reliability helped to find out the concurrence of responses. Occurrence of same outcomes in study made the instrument reliable. Acording to Webb, Shavelson, & Haertel (2006), Coefficient alpha (also known as "Cronbach's alpha") is perhaps the most widely used reliability coefficient. It estimates test-score reliability from a single test administration using information from the relationship among test items. That is, it provides an estimate of reliability based on the variation among items internally to the test; hence it is also called an internal-consistency coefficient. (P.82-82)

Method of Universe of elements was used for this research study which makes instrument reliable. Applying method of Universe, the coefficient of reliability shows if an observed punctuation in items of sample calculate approximately same the actual punctuation in Universe of items. The reliability analysis supports to find out the satisfaction of user about questionnaire in which inter-relation among all elements, and internal consistency can also be measured. Cronbach Alpha was applied to find out internal consistency which was based upon inter-relationship between different elements and on rate of correlation. In order to find out the information about correct delivery of questionnaire, pilot test was conducted which helped to examine the reliability and satisfaction of clients.

In this study coefficient has been applied to the following questions from teacher educator questionnaire and B.Ed trainees.

3.4.   Reliability testing

3.4.1. Questionnaire for teacher educators

The reliability of a nine items from all 43 items was less than the reliability of 0.672 alpha coefficients, which were later, reduced to 34 items. This in return resulted 0.934 alpha co-efficient.

Table 5. Reliability Statistics

Cronbach Alpha	N of Items
.934	34

3.4.2. Questionnaire for B. Ed trainees

For testing the reliability of inter-item consistency for the supportive environment for using ICT in teaching and learning process, the Cronbach Alpha appeared as 0.828.

Table 6. Reliability statistics of questionnaire developed for B.Ed trainees

Cronbach Alpha	Cronbach Alpha Based on Standardized Items	N of Items
0.829	0.828	6

The result shows that the obtained value is very close to 1 which is the maximum internal consistency measure. Therefore, reliability is satisfactory. The correlation in range of 0.8 to 1 is supposed to be good estimate of internal consistency. We can conclude that the instrument was highly reliable.

3.5.   Implementation of Research Study in Field

The study covers following field activities which include collection of data through questionnaires, focus group discussions, class room observations and interviews from head of institutions.

3.5.1. Data Collection

Multiple research tools were used to collect the data regarding integration of ICT in teaching learning process. Questionnaires, focus group discussion, classroom observation and interviews were the tools of research. Population of study was from public sector institution. Therefore, formal permission was obtained from each principal of college of education and PITE Sindh regarding research study within the scope. Each head of institution allowed and allocated time for data collection so that academic activities might not be disturbed. Before data collection, a meeting was called by Principals and teacher educators were briefed about the research study.

3.5.2. Administration of the Questionnaire

As discussed previously regarding the instruments of research, two questionnaires, one for teacher educators and the other for B.Ed trainees were proposed in research design to collect the data for this study. The researcher personally administered the questionnaires and conducted in-depth interviews with the heads of institutions. The in-depth interviews from heads of institutions included some same questions about role of ICT in teaching, but emphasis was on administrative role of heads of institution to facilitate the use of ICT in teaching.

The respondents were teacher educators, head of institution and students enrolled in Bachelor of Education (B.Ed) in the institution. Questionnaires for teacher educators were distributed to the teacher educators of all subjects in B.Ed classes. After getting consent from respondents, they were requested to fill up the questionnaire. Similarly, questionnaires for students were distributed to B.Ed trainees in the concerned colleges. Each institute was visited by the researcher, who personally administrated the questionnaires to the respondents and the filled up questionnaires were collected on the same day. This process helped the researcher to get faster response and advantages included briefing about questions to the participants and explaining the significance of research. This, in return, increased the interest level of respondents.

3.5.2. Focus Group Discussion

To get the in-depth information, focus group discussions were conducted with teacher educators of Government College of Education Sukkur and Provincial Institute of Teacher Education (PITE). Initially, meetings were held with both head of institutions. The aim of study and its scope was shared with heads of institutions. Formal approval and full support of heads of institutions enabled the researcher to ensure the participation of teacher educators. Organizational support in the respective institutions helped in planning and arranging the focus group discussion.

The purpose of these focus group discussions was to collect the information regarding use of ICT in teacher education, its impact on learning achievement and problems faced by teacher educators in use of ICT tools for instruction. In the college of education at Sukkur, 17 participants were invited and in PITE, 08 teacher educators of different

subjects (educational technology, Educational Measurement & Evaluation, teaching of physics and Environmental Education) participated in focus group discussion. The researcher himself played role of moderator and kept the group focused on discussion on integration of ICT in teacher education. Consent form was provided to each participant and sufficient time was allotted for the participants to read the consent form and ask if they had any question or concern before starting the group discussion. Guided approach was adopted by the researcher to start each question and participants were allowed to express their ideas. However, following further probing questions were asked.

- Could you please share more about difference between teaching without using ICT tools and with ICT tools?
- Could you please explain the impact of ICT on learning achievement?
- Can you give example of ICT tools used in instruction?

Every member of the group was encouraged (i) to share his/her ideas freely, (ii) to create conductive environment and (iii) to listen to everyone. The group was very supportive with similar educational backgrounds and social status which encouraged them to share their ideas openly. Discussions were recorded digitally with the permission of the participants and simultaneously, important notes were taken by the moderator. Before analysis of the obtained data, recorded discussions were transcribed.

3.5.3. Classroom Observation

The researcher attended three B.Ed classes of different subject, namely, educational technology, Educational Measurement & Evaluation and Environmental Education to examine the extent to which ICT was integrated in teaching and learning process. During

classroom observation, the researcher observed the use of ICT tools in classroom by the individual students.

Before classroom observation, pre-observation form (placed at APPENDIX G) was prepared and filled by the researcher during classroom observations that included time of class, subject and topic (s) to be taught, placement of topic(s) in study plan ,i.e. whether in the start, middle or end of study plan. In addition, classroom setting and teaching aids available in classroom were noted during classroom observation. When class was started by the teacher educator, the researcher took notes on classroom activity sheet prepared for classroom observation. It was noted how teacher educator started lesson, its timing and how the teacher introduced the lesson. The content, teaching methodology, integration of ICT in teaching learning process, usage of ICT tools and interaction of teacher educator with students were recorded and noted.

3.5.4. In-depth Interviews with heads of institutions

Prior permission was obtained from each principal of the colleges. For this study, only principals of colleges of education were interviewed. Following semi- structured questions were constructed to focus the discussion on topic:

1. How do you recognize the role of ICT in teacher education?

2. To what extent is integration of ICT important in teaching process?

3. What facilities have been provided to enable ICT-supported teaching?

4. How are teacher educators supported for integration of ICT in teaching?

5. Are the teacher educators in colleges regularly trained in ICT-supported teaching?

6. What are the problems and major challenges in use of ICT in your college?

7. What would help the most as a way forward with ICT?

Guided approach was adopted by the researcher to start each question and participants were allowed to express their ideas. However, following further probing questions were also asked:

1. Could you please share the strengths and weaknesses regarding use of ICT tools in your college?

2. Could you please explain the problems and challenges for ICT-supported teaching?

3. Could you please explain what type of support you require from the government?

3.5.5. Steps of Data Collection and Data Analysis

For quantitative data collections, following procedural steps were taken to complete this study.

- Step 1. Development of the questionnaires in the light of literature review;

- Step 2. Peer review of the developed questionnaires;

- Step 3. Review of questionnaires by experts;

- Step 4. Pilot testing of the questionnaires;

- Step 5. Revision of questionnaires after checking their validity and reliability;

- Step 6. Distribution of questionnaires among participants, personally administrated by the researcher;

- Step 7. Post- data collection management and coding of qualitative data collected through questionnaires,

- Step 8. The data entry in SPSS;

- Step 9. Data analysis and interpretation

For qualitative data collections, following procedural steps were taken in the study.

- Step 1. Development of focus group discussion and interview guided questions including observation tools for classroom observation;

- Step 2. Peer review of developed open-ended guiding questions developed for focus group discussion, interviews and tools for classroom observation;

- Step 3. Review by experts;

- Step 4. Focus group discussion, interviews and observation of classroom practices;

- Step 5. Recording and noting of focus group discussion, interviews and observation of classroom practices;

- Step 6. Transcription and coding of recording and notes of focus group discussion, interviews and classroom observation,

- Step 7. Data analysis and interpretation

3.6. Data analysis

There are different ideas and options in mixed method research study regarding data collection process and data analysis. A concurrent data analysis was made for this study which consists of sequential data collection, a combination of both quantitative and qualitative data using mixed method approach. The survey research comprises both close-ended and open-ended responses; therefore, statistical analysis was required for close-ended responses while open-ended responses required content analysis (Tashakkori, & Teddlie, 1998). The integration of both quantitative and qualitative analysis, using comprehensive qualitative investigation with the descriptive statistics, provided opportunity to understand the research phenomenon.

Through questionnaires, in most of the questions, teacher educators and B.Ed trainees were asked to provide responses on a five-point Likert scale for which descriptive statistics was generated. After data coding, statistical analysis was made through Statistical Package for Social Sciences (SPSS) and descriptive analysis was used to find out the trends. Frequencies and percentages of items in questionnaires were calculated through descriptive analysis. To explore the significance of difference between dependent variables and independent variables, Chia squire was used for this study.

3.7. Validity and Reliability of Study

According to Merrian (1998), it is very important that reader be convinced with the procedure adopted in quantitative research and through qualitative analysis one should reach at the conclusion through details which makes sense. In the mixed

92

method approach, both quantitative and qualitative methods are combined so that validity and reliability must be ensured. Here approach, sources of information and data analysis are considered through triangulation. In this study, for the implementation of internal and external strategies and reliability, following steps were taken into consideration.

1. For validity with criteria of triangulation, peers' examination and bias of researcher, review of literature and procedure of data collection were used to verify the data collected through focus group discussion, interviews and classroom observation. The synthesis of quantitative and qualitative information was reviewed by the supervisor. After clarification by the researcher's theoretical concepts, limitations and delimitation, the findings and results were evaluated with the literature reviewed for this study.

2. For validity with criteria of nominated population and sample, criteria for the selection of participants of study and sampling techniques were discussed in detail in population and sample section.

3. For reliability, triangulation methodology and reliable transcription, items in questionnaires were designed and finalized after review of literature, feedback by supervisor and pilot testing. The data gathering methods, analysis of data and synthesis of data collected through all instruments were used to triangulate the information. Recordings, transcripts were made by the researcher and inspected by other experts for cross-validation and verification. The synthesis of data was reviewed by the supervisor.

3.8.   Ethical Considerations

Ethical issues in research are very important during research. The confidentiality of participants, information, and fairness in reporting are matters of concern in the qualitative research. Focus group interviews in qualitative research are to be handled carefully keeping in view the strict ethical codes. Participants in qualitative research are highly concerned about their privacy and confidentiality. Booth, Colomb, & Williams (2003) defining the consent stated:

> When you report your research to meet the needs of your community, you invite
> yourself to join that ethical community in a search for the common good. When you
> respect sources, preserve and acknowledge data that may run against your results,
> assert claims only as strongly as warranted, acknowledge the limits of your certainty,
> and meet all the other ethical limits on your report, you move beyond gaining a grade
> or other material good; you even move beyond simply obeying important moral rules,
> such as "Never harm anyone by cheating. (p.288)

Consent from participants is very important, therefore, during the research, both harm to participants and informed consent were carefully handled. Determination of consent rests on the will of participants and its responsibility cannot be delegated (Hutton, Eccles, & Grimshaw, 2008). Following the ethical rule of harm to participant, the researcher did not disclose the identity of one group of research participants to other group of participants. Besides that, the researcher was also responsible for the confidentiality of

information for the purpose of approved research. All the data was kept at secure place and data was coded during data analysis and the identification of participants was removed from documents. Informed consent ethical code was properly followed. Before the start of research, participants were requested for the informed consent through consent form (placed at Appendix C). Prior permission was obtained from the heads of institution and every participant signed the consent form after reading it. The group discussions were conducted after the written consent from the participants.

During FDGs and interviews, the confidentiality and neutrality to the participants was not compromised by the researcher. The investigator did not impose any personal opinion or authority and conclusiveness during group interviews. The interests of the participants, particularly personal views, regarding administration and colleagues were well protected. The interaction with the participants remained very cordial which provided opportunity to understand, learn, explore and discover the valuable information.

3.9. PILOT TESTING APPLICATION OF MODEL

This part of study covers the testing application of model into classroom practices. This section discusses the setting for application of model and pilot testing of its applications. Description of activities and process of implementation of model were provided.

3.9.1. Context of testing applications of Model

Role of ICT in education and training is increasing day by day. Therefore, it is necessary to assess the effectiveness of ICT supported teacher training model and provides information to the government to reshape the programs for ensuring its best

utilization and implementation in teacher training programs. The application of model developed were tested to find out the learning outcomes and change in teaching learning process exploring new relationship between teacher and students, students and content and classroom settings using different ICT tools in teaching methodology. Testing applications of model provides further valuable information for development, improvement and opportunity for expansion of designed model. Testing application, therefore, provides the information on strengths and weaknesses of model, outcome of designed applications, sequences and structural changes which helps to modify the model, if required.

3.9.2. Methodology of tryout of Model

Both quantitative and qualitative analysis of data was used to obtain the answers to the research questions. The researcher submitted application to the Minister of Education and Literacy Department, Government of Sindh for permission to test the application of the model. The permission was granted by Education Minister for this study in Government College of education at Sukkur and notified by Education and Literacy department Government of Sindh. The proposed application plan, consent form and the copy of the letter were submitted to the Principal of government of college of education Sukkur. The data were collected to find out the effectiveness of tools in professional development for initial teacher education, its validation and importance for teaching practices by teacher educators. This model covers four general areas to find out how teacher educators know the role of ICT in teaching methodology. The testing process was completed in two and half months (December, 2012- February, 2013). Class

activities were conducted at Government College of Education Sukkur. There were 64 B.Ed students registered in 2012 batch. The subjects were taught by the same teachers who had been assigned for teaching that academic year. Teacher educators were trained and guided to prepare the lesson plans according to the theoretical frame work of model using ICT tools in instruction.

The researcher distributed consent forms in November, 2012 and the participants were briefed by the researcher on consent form about the model. The participants allowed researcher to test the application of model and changes in teaching methodology using ICT in classroom practices. Application of model was completed for B.Ed class using ICT tools in their academic setting. The basic information was obtained from teacher educators that included use of ICT in classroom practices, internet facilities and availability of multimedia in classroom. This study assessed the application of model in the following three areas of model:

1. Integration of ICT in instructional practices
2. Problem-solving content, educational objectives, life-long learning
3. Knowledge creation through self-learning and management

3.9.3. Population and Sample of tryout of Model

The sample of this study was 04 teacher educators of educational technology, Educational Measurement & Evaluation, teaching of physics and Environmental Education from Government College of Education Sukkur. A convenience sample representing 25 percent of teacher educators from Government College of Education accepted to participate in this study. Government College of Education was selected

97

because of the use of ICT settings and existing status. The scope of PITE was different

than that of the colleges of education. Two colleges were located in Karachi that were not

feasible due to security concerns and continual disturbances in academic activities. The

availability of ICT facilities may have affected the integration of ICT in teacher

education.

Table 7. Subject wise number of participants

Name of the subject	Number of teacher educator	Number of B.Ed trainees
Educational Technology	01	16
Educational Measurement & Evaluation	01	12
Teaching of Physics	01	18
Environmental Education	01	18
Total	04	64

3.9.4. Instruments of tryout of Model

Multiple research tools were used to answer the research questions to evaluate the

application of ICT-supported model and its impact on teaching learning process.

Questionnaires, evaluation sheets and focus group discussion were the tools of the

research. The data for study was collected through Questionnaire for B.Ed trainees and

Focus Group Discussions with teachers and B.Ed trainees.

3.9.4.1.　Questionnaire for B.Ed trainees

The questionnaire was developed to collect the information from B.Ed trainees who attended the classes as designed for the testing of application of model. The questionnaire was developed on the basis of review of literature and it consisted of five-point Likert scale 15 items. The questionnaire was reviewed by the supervisor and corrections were made in the light of the feedback.

3.9.4.2.　Qualitative feedback of participants

The researcher chose focus groups discussion as in instrument tool to explore the feedback on ICT-supported model, its applicability and acceptance of integration of ICT in teaching learning process and its impact on learning outcomes. The purposes of these focus group discussions were to collect the information on applicability of model and its impact on learning achievement. Consent form was developed for the permission of the participants and their voluntary participation in research study. Semi- structured questions were constructed to focus the discussion on topic:

1. Can you share the advantages and disadvantages of ICT in teaching?
2. What difference did you find in your teaching?

3.9.5. Points to be considered during tryout of model

The matrix used in table 53 was used to assess each of the five ICT-supported tools used as communication tools for instruction. Assessing the ICT-supported modes of communication at college of Education Sukkur also helped to find out the strength of

developed ICT-based model which was the main research question of the study followed by other subsidiary sub-questions as given below.

1. Do B.Ed trainees find ICT-based model creative enough for learning-environment at teacher training institutions?

   i) To what extent do B.Ed trainees find the use of multimedia effective?

   ii) Do B.Ed trainees find the use of World Wide Web a flexible source of learning environment?

   iii) To what extent do B.Ed trainees find the use of SMS chat creative, interactive and collaborative among stakeholders?

   iv) Do B.Ed trainees find the use of email helpful and supportive in their professional learning?

   v) To what extent do B.Ed trainees find the use of video conference an interactive and collaborative source of learning?

2. Does this ICT-supported model achieve learning outcomes?

3. Is the ICT-based learning model at teacher training institutions cost-effective and penny-productive?

In addition, it also included how teacher educators apply their knowledge into classroom practices to achieve the objectives. The four areas of model are:

1. Competencies to use ICT tools for instructional tasks

2. Shared information and collaborative learning environment

3. Innovative practices and policy reforms to achieve educational objectives

4. Digital Literacy

3.9.6. Teaching Environment during tryout of Model

The classes were conducted by subject teacher educators in classroom equipped with ICT tools. The setting of classroom was suitable for teacher to divide the class into group of students or in pairs or by set rules for discussion and interactive learning according to the requirement of tasks. The teacher was in position to directly supervise and monitor the class activities and performance of students.

3.9.7. Context of effectiveness of Model

Effectiveness of ICT-supported teacher training model provides information on its effectiveness in teaching and learning process to achieve educational objectives reflecting benefit of stakeholders. It was therefore important to identify appropriateness and efficiency to use ICT in teacher education programs including the following key areas:

1. Appropriateness and efficiency in using ICT tools for instructions;

2. Appropriateness and efficiency of ICT-supported teaching methodology; and

3. Cost effectiveness of ICT-supported teacher training model.

The first part, appropriateness and efficiency in using ICT tools for instructions refers to impact of ICT tools on students' performance, difference between existing teaching methods and ICT-supported delivery. The second part, appropriateness and efficiency of ICT- supported teaching methodology refers to teaching and learning process using different means of communication supported by tools and techniques creating interactive, collaborative and flexible learning environment. The third part, cost effectiveness of ICT-

supported teacher training model refers to cost effectiveness using ICT- supported

instructional program as compared to cost effectiveness of existing or alternative teaching

methods.

3.9.8. Opinion of participants about the Model

After completion of 40 classes, a questionnaire was provided to the students to

investigate effectiveness of ICT-supported instructional practices, knowledge creation

through self learning, problem solving and its relationship presented in the model based

on flexibility, interactive approach and collaborative method. The questionnaire covered

aspects of (i) Integration, appropriateness and efficiency of ICT-supported instructional

model, (ii) Appropriateness and efficiency in using ICT tools for instructions and

problem solving, and (iii) Cost effectiveness of ICT-supported teacher training model.

The questionnaire is placed at APPENDIX F.

CHAPTER FOUR

DATA ANALYSIS

This chapter covers both quantitative and qualitative analysis of data and description concluded from the instruments of this research study. The quantitative data analyses have been obtained using SPSS software while qualitative analysis and results were described with the help of NVIVO 10.

For convenience, following abbreviation are used in tables:

C = Constantly

F = Frequently

O =Occasionally

R =Rarely

N =Never

NR =No Response

4.1. QUANTITATIVE ANALYSIS

The data was collected through questionnaires developed for teacher educators and B.Ed trainees. For quantitative analysis, SPSS 18 was used to analyze the data collected through questionnaires

4.1.1. Demographic information

Introductory information was collected in the first section of questionnaires. The analysis of each component is given below.

4.1.2. Participation by gender - B.Ed trainees

The introductory part of questionnaire for B.Ed trainees covers gender information of the participants. The below table shows gender wise information of B.Ed trainees

Table 8. Analysis of B.Ed trainees by gender

Gender		Frequency	Percent
	Male	40	27.2
	Female	107	72.8
	Total	147	100.0

Table 8 illustrates that the study comprised n= 40 male respondents and 107 female respondents constituting 147 B.Ed trainees in all.

4.1.3. Participation by gender- Teacher Educators

The introductory part of questionnaire for teacher educators covers gender information of the participants. The gender information of teacher educators is shown in below table.

Table 9. Analysis of teacher educators by gender

	Frequency	Percent
Male	29	78.4
Female	8	21.6
Total	37	100.0

There were 147 B.Ed trainees who participated in this study, out of which 73% were female and 27% were male. These students belonged to various government teacher education institutes in Sindh. On the other hand, there were 37 teacher educators who participated, of which 78% were male and 22% female participants.

The teacher educators have academic qualification of masters on various subjects that include Math, Economics, Urdu, Sindhi, English and physics. Some of the students were M.Phil and Master in Information Technology. These teachers taught various subjects which include languages, teaching of Physics, Curriculum development, teaching of mathematics, chemistry, computer science etc.

4.1.4. Courses Attended by Teacher educators

Questions were asked from teacher educators regarding the computer training courses attended. The figure 4 below shows the status of computer training attended by teacher educators.
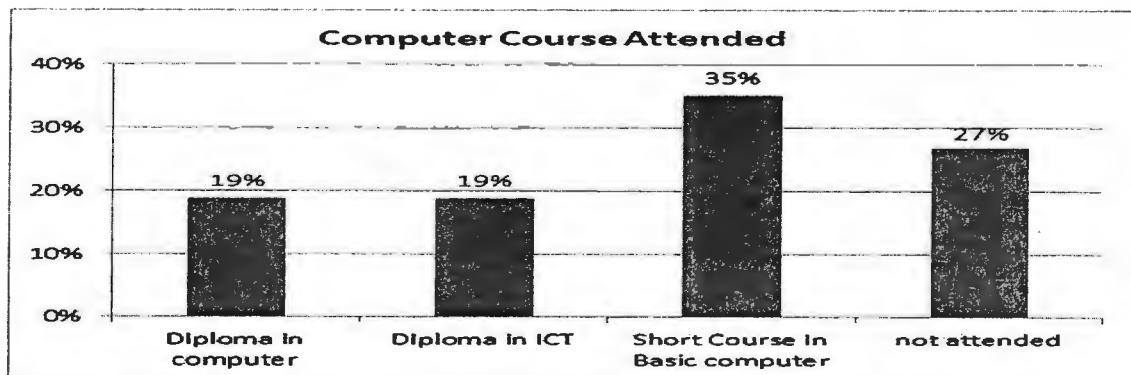
Figure 4. Computer courses attended by teacher educators

The figure shows that 19% teacher educators reported that they have completed diploma in ICT and computer while only 35% teacher educators had attended basic computer courses. However the results revealed that almost 27% of the teacher educators did not attend any computer course.

4.1.5. Course Attended by B.Ed trainees

Table 10. Computer courses attended by B.Ed trainees

	Frequency	Valid Percent
Diploma in computer	25	17.0
Diploma in ICT	4	2.7
Short Course in Basic computer	58	39.5
No Response	60	40.8
Total	147	100.0

Table 10 illustrates that 17% of B.Ed trainees had obtained a diploma in computer, 2.7% were found having diploma in ICT while 39.5% B.Ed trainees have completed short course in basic computer. The results raveled that 40.8% B.Ed trainees did not respond to this question at all.

4.1.6. Professional Qualification of Teacher Educators

The data analysis of professional qualification of teacher educators is shown in figure 5as given below:
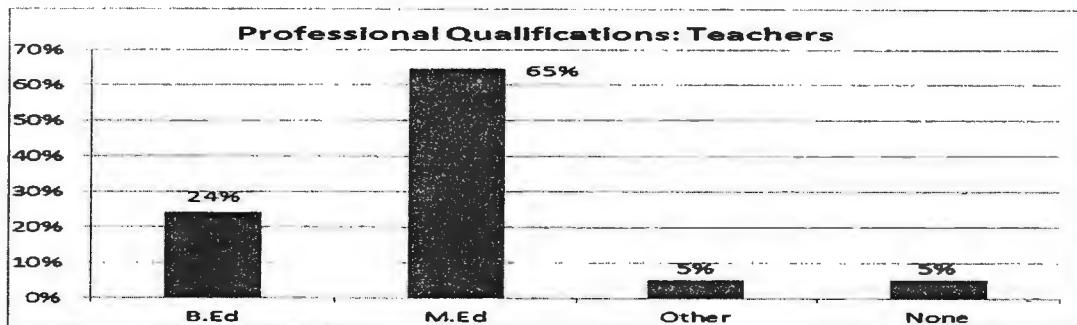
Figure 5. **Professional qualifications of teacher educators**

The professional qualification indicates the professional commitment of the teachers with teaching as a profession. The study results found that 24% of teacher in the colleges of education and PITE possess the professional qualification of Bachelor in Education (B.Ed) 65% were found having Master in Education (M.Ed). However, only 5% teachers were found having qualification other than B.Ed or M.Ed and 5% had not obtained any professional qualification in the field of education.

4.1.7. Teacher Educators' Experience:

The experience of teacher educators plays a vital role in classroom teaching. The figure below shows the experiences of teacher educators.
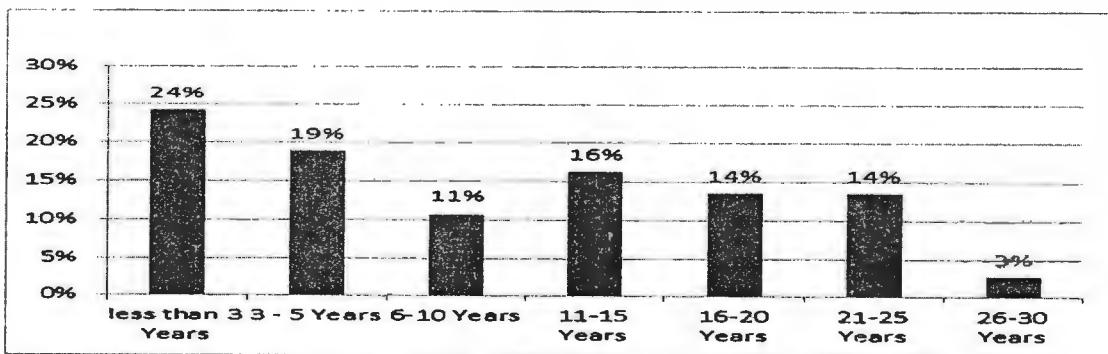
Figure 6. **Experiences of teacher educators**

The information about the experience was obtained in different ranges. Only 24% teacher educators were found having less than three years experience and rest of the

teacher educators had experience more than 3 years. The results show that 19% and 11% teacher educators had experience of 3-5 years and 6-10 years respectively while 16% of them had experience between 11-15 years. About 14% teacher educators were those who had teaching experience between 16 to 25 years. However only 3% teachers were found having 26 to 30 years experience.

4.2. Access and usage of ICT tools

Access to ICT tools is a pre-requisite for the proper implementation of ICT in teaching and learning process. In addition, it is also equally important to know how effectively ICT tools were used in teaching and learning process. Therefore, the questions were asked to examine the existing status of availability of ICT tools in the institutions and their usage in classroom teaching.

4.2.1. Access of ICT tools for B.Ed trainees

4.2.1.1. Computers

Table 11: Access to computers

	Frequency	Percent
Yes	136	92.5
No	11	7.5
Total	147	100.0

Table 11 illustrates that 92.5 % B.Ed trainees responded yes against the question asked about the availability of computers in the institutions. However, only 7.5% responded that they did not see the access o computers in the institutions.

Table 12: Usage of computer by B.Ed trainees

		Computer Usage						Total
		C	F	O	R	N	N R	
Usage of computer	Yes	78	21	14	19	3	1	136
		57.4%	15.4%	10.3%	14.0%	2.2%	.7%	100.0%
	No	1	0	2	5	2	1	11
		9.1%	0.0%	18.2%	45.5%	18.2%	9.1%	100.0%
Total		79	21	16	24	5	2	147
		53.7%	14.3%	10.9%	16.3%	3.4%	1.4%	100.0%

Computer is the basic tool to for the implementation of ICT. The table 12 indicates that 57.4% B.Ed trainees were constantly using computers while result shows 15.4%, 10.3% and 14% of B.Ed trainees were using computer frequently and occasionally and rarely respectively. However, only 3 B.Ed trainees were not using and one B.Ed trainees did not respond to the question.

4.2.1.2. Well Established IT Labs for B.Ed trainees

Well established IT labs in any institution indicate the facilities available for both the students and teachers for ICT- supported teaching and learning process. The questions regarding IT labs and their usage were incorporated in the questionnaire so that researcher clear picture may be portrayed for development of the model.

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Table 13: Information technology labs available for B.Ed trainees

	Frequency	Percent
Yes	114	77.6
No	33	22.4
Total	147	100.0

Around 78% students had the access to well-established IT laboratories for learning while 22% students did not have the same facility in their respective colleges.

Table 14: Usage of Information technology labs by B.Ed trainees

		Usage of IT labs						Total
		C	F	O	R	N	N R	
Usage of IT labs by B.Ed trainees	Yes	26	22	19	17	19	11	114
		22.8%	19.3%	16.7%	14.9%	16.7%	9.6%	100.0%
	No	0	2	2	11	16	2	33
		-	6.1%	6.1%	33.3%	48.5%	6.1%	100.0%
Total		26	24	21	28	35	13	147
		17.7%	16.3%	14.3%	19.0%	23.8%	8.8%	100.0%

Tables 14 indicate that IT labs were used by B.Ed trainees. The overall usage of IT labs was found near about 73.7% out of which 22.8% were using labs constantly, 19.3% frequently, 16.7% occasionally and 14.9% were usage rarely. However, 16.7% B.Ed trainees were not using IT labs and 9.6% participant did not respond to the question.

4.2.1.3. Full Time Internet Access to Students

Table 15: Internet access to B.Ed trainees

	Frequency	Percent
Yes	50	34.0
No	97	66.0
Total	147	100.0

Table 15 indicates that only 34% B.Ed trainees had access to the internet while 66% of participants responded that they did not have internet access in the institution.

Table 16. Usage of Internet by B.Ed trainees

		Internet Usage						
		C	F	O	R	N	N R	Total
Full time internet to B.Ed trainees for usage	Yes	19	16	3	2	9	1	50
		38.0%	32.0%	6.0%	4.0%	18.0%	2.0%	100.0%
	No	2	13	19	20	40	3	97
		2.1%	13.4%	19.6%	20.6%	41.2%	3.1%	100.0%
Total		21	29	22	22	49	4	147
		14.3%	19.7%	15.0%	15.0%	33.3%	2.7%	100.0%

The table 16 shows the status of access to internet and its usage to the B.Ed trainees. The overall access to internet was found 34% out of which 38% were using constantly, 32% frequently, 6% occasionally and 4% were using rarely. However, 18% of B.Ed trainees

111

who responded yes were not using internet while only 2% participants did not respond to the question.

4.2.1.4. Computer Section In Library

Computer section in any institution is a facility for the users to access the digital resources. The purpose of this question was to explore the accessibility of computers and internet facilities for the B.Ed trainees in the institutions.

Table 17. Availability of computer section in library

	Frequency	Percent
Yes	89	60.5
No	58	39.5
Total	147	100.0

As mentioned in Table 17, it was found that 60.5% of the participants confirmed availability of computer section in libraries while 39.5% verified that they had no computer section in their libraries.

Table 18. Usage of computers in library by B.Ed trainees

		Usage of Computers in library						
		C	F	O	R	N	NR	Total
Usage of computer section in library	Yes	43	11	3	8	13	11	89
		48.3%	12.4%	3.4%	9.0%	14.6%	12.4%	100.0%
	No	0	3	2	5	46	2	58
		0.0%	5.2%	3.4%	8.6%	79.3%	3.4%	100.0%
Total		43	14	5	13	59	13	147
		29.3%	9.5%	3.4%	8.8%	40.1%	8.8%	100.0%

The table 18 shows the status of usage of computer section in libraries by the B.ED trainees of institutions where the study was conducted. The overall availability of computer section in libraries was found to be 60.5% out of which 48.3% were using constantly, 12.4% frequently, 3.4% occasionally and 9% were using computer section rarely. However, 14.6% of B.Ed trainees who responded yes were not using internet while 12.4% participants did not respond to the question.

4.1.1.1. Overhead Projector in Classroom

Table 19: Availability of Overhead projector in classroom

	Frequency	Percent
Yes	78	53.1
No	63	42.9
No Response	6	4.1
Total	147	100.0

Table 19 indicates that around 53.1 % participant confirmed the availability of overhead projector in classroom while 24.9% confirmed non-availability of overhead projector in classrooms. However, only 4.1% did not respond to the question.

Table 20: Usage of Overhead projector in classroom

| | | Usage of Overhead projector in classroom | | | | | | |
		C	F	O	R	N	NR	Total
Usage of Overhead projector in classroom	Yes	28	15	11	4	15	5	78
		35.9%	19.2%	14.1%	5.1%	19.2%	6.4%	100.0%
	No	0	2	11	7	42	1	63
		0.0%	3.2%	17.5%	11.1%	66.7%	1.6%	100.0%
	N R	0	0	0	0	3	3	6
		0.0%	0.0%	0.0%	0.0%	50.0%	50.0%	100.0%
Total		28	17	22	11	60	9	147
		19.0%	11.6%	15.0%	7.5%	40.8%	6.1%	100.0%

Table 20 describes that the use of projector in the formal classrooms by the B.Ed trainees was not efficient. Only 78 respondents from 147 agreed that they had the overhead projector utility in their respective colleges. The overall availability of Overhead projector was found 53.1% out of which 35.9% were using it constantly, 19.2% frequently, 14.1% occasionally and 5.1% were using Overhead projector rarely in their classrooms. However, 14.6% of B.Ed trainees who responded yes were not using internet while 12.4% participants did not respond to the question.

4.1.1.2. Multimedia In Classroom

Multimedia is very valuable ICT tool which is commonly used for presentation in classroom practices and delivery of lectures in class by teacher educators. The questions were asked about the availably and of usage of Multimedia in teaching and learning process in the colleges of education and PITE where study was conducted.

Table 21. Availability of Multimedia in classroom

	Frequency	Percent
Yes	78	53.1
No	61	41.5
No Response	8	5.4
Total	147	100.0

The table 21 illustrates that 53.1 % responded that multimedia facility is available in their classrooms. Around 41.5 % confirmed non-availability of multimedia in classrooms. However, 5.4% participants did not respond to this question.

Table 22: Usage of Multimedia in classroom in teaching and learning process

		Usage of Multimedia in classroom						
		C	F	O	R	N	NR	Total
Multime	Yes	24	10	14	15	14	1	78
dia in		30.8%	12.8%	17.9%	19.2%	17.9%	1.3%	100.0%

115

classroo m	No	0	0	8	10	42	1	61
		0.0%	0.0%	13.1%	16.4%	68.9%	1.6%	100.0%
	No Response	0	0	0	0	5	3	8
		0.0%	0.0%	0.0%	0.0%	62.5%	37.5%	100.0%
Total		24	10	22	25	61	5	147
		16.3%	6.8%	15.0%	17.0%	41.5%	3.4%	100.0%

Table 22 indicates that 38.8% respondents responded that multimedia is constantly used during classroom while 12.8% confirmed frequent use of multimedia in classroom. The results shows that 17.9% and 19.2% multimedia is used occasionally and rarely respectively.

4.1.1.3. Availibility and usage of Seminar Room

Seminar room is commonly usage for used for presentation, video conferences and other academic activities at large scale, particularly academic lectures and seminars.

Table 23: Availability of seminar room

	Frequency	Percent
Yes	104	70.7
No	30	20.4
No Response	13	8.8
Total	147	100.0

Table 23 describes that 70.7 % B.Ed trainees confirmed that they had the facility of seminar room in their respective training colleges whereas 20.4% from them did not confirm the availability of seminar room. However 8.9 % of the respondents did not respond to this item at all.

Table 24: Usage of seminar room

		Usage of Seminar room						
		C	F	O	R	N	NR	Total
Access to Seminar room	Yes	30	20	20	15	15	4	104
		28.8%	19.2%	19.2%	14.4%	14.4%	3.8%	100.0%
	No	0	4	3	5	18	0	30
		0.0%	13.3%	10.0%	16.7%	60.0%	0.0%	100.0%
	No Response	0	0	0	2	7	4	13
		0.0%	0.0%	0.0%	15.4%	53.8%	30.8%	100.0%
Total		30	24	23	22	40	8	147
		20.4%	16.3%	15.6%	15.0%	27.2%	5.4%	100.0%

Table 24 indicates that 28.8%, 19.2% and 19.2% of participants confirmed constantly, frequently and occasionally usage of seminar room respectively. However, 14.45 % highlighted rare use of seminar room while 14.4% did not confirm its use in seminar room.

4.1.1.4. Multimedia In Seminar Room

The use of multimedia in seminar room is commonly used for video conferences and academic lectures. This question examines the status of availability of multimedia in seminar room and its usage.

Table 25: Availability of Multimedia in seminar room

	Frequency	Percent
Yes	93	63.3
No	37	25.2
No Response	17	11.6
Total	147	100.0

Table 25 describes that 63.3 % B.Ed trainees had access to multimedia in their seminar rooms while 25.2% responded that they did not have this facility in their seminar rooms. However, 11.6% from participants did not respond to the question.

Table 26: Usage of multimedia in seminar room

		Usage of Multimedia in seminar room						
		C	F	O	R	N	NR	Total
Usage of Multimedia in seminar	Yes	32	10	20	10	13	8	93
		34.4%	10.8%	21.5%	10.8%	14.0%	8.6%	100.0%
	No	0	5	4	5	21	2	37
		0.0%	13.5%	10.8%	13.5%	56.8%	5.4%	100.0%

118

room	NR	0	0	1	4	9	3	17
		0.0%	0.0%	5.9%	23.5%	52.9%	17.6%	100.0%
Total		32	15	25	19	43	13	147
		21.8%	10.2%	17.0%	12.9%	29.3%	8.8%	100.0%

Table 26 indicates that 34.8% respondents responded that multimedia is constantly used seminar room while 10.8% confirmed frequent use of multimedia in classroom. The results show that 21.5% and 10.8% multimedia is used occasionally and rarely respectively. However, 14.6% responded that multimedia was not used in seminar rooms while 8.6% participants did not respond to this question.

4.1.1.5. Printer

Printer is a very important device used for the printing of material. The researcher included this question to explore the availability and use of printer for B.Ed trainees in the institutions where study was conducted.

Table 27: Availability of printer

		Frequency	Percent
	Yes	98	66.7
	No	47	32.0
	No Response	2	1.4
	Total	147	100.0

119

Table 27 indicates that 66.7% B.Ed trainees had access to printer in their respective colleges while 32% of them responded that they had such facility in the institutions. However, only 1.4% did not respond to this question.

Table 28: Usage of printers

		Usage of Printers						Total
		C	F	O	R	N	NR	
Access to Printers	Yes	24	18	20	20	14	2	98
		24.5%	18.4%	20.4%	20.4%	14.3%	2.0%	100.0%
	No	0	1	7	10	27	2	47
		0.0%	2.1%	14.9%	21.3%	57.4%	4.3%	100.0%
	No Response	0	0	0	0	2	0	2
		0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
Total		24	19	27	30	43	4	147
		16.3%	12.9%	18.4%	20.4%	29.3%	2.7%	100.0%

Table 28 illustrates that the overall availability of facility of printer was available to 66.7% out of which 24..5% were using printing facility constantly, 18.4% were using it frequently, 20.4% were using printing facility occasionally and rarely. However, 14.4% of B.Ed trainees who responded yes were not using printing facility for academic activities while 2% participants did not respond to the question.

4.1.1.6. Scanner

Scanner is very valuable invention of modern world which is significant speedy way of electronic communication to send the scanned copies of documents. The questions were asked from the participants of study to examine the availability of scanner and its usage in the institutions.

Table 29: Availability of scanner

		Frequency	Percent
Valid	Yes	82	55.8
	No	56	38.1
	No Response	9	6.1
	Total	147	100.0

Table 29 describes that around 55.8% B.Ed trainees confirmed the availability of scanner in the institutions while 38.1% responded that that they have not found scanner. However, 6.1% B.Ed trainees did not respond to this question.

Table 30: Usage of scanner

		Usage of Scanners						
		C	F	O	R	N	NR	Total
Access to	Yes	18	11	19	15	15	4	82
		22.0%	13.4%	23.2%	18.3%	18.3%	4.9%	100.0%

Scanner s	No	0	2	5	7	40	2	56
		0.0%	3.6%	8.9%	12.5%	71.4%	3.6%	100.0%
	No Response	0	0	0	0	6	3	9
		0.0%	0.0%	0.0%	0.0%	66.7%	33.3%	100.0%
Total		18	13	24	22	61	9	147
		12.2%	8.8%	16.3%	15.0%	41.5%	6.1%	100.0%

The result Table 30 indicates that the overall availability of facility of scanner was available to 55.8% to the B.Ed trainees out of which 22 % were using scanning facility constantly, 13.4% were using it frequently while 23.2% and 18.3% were using scanning facility occasionally and rarely respectively. However, 18.3% of B.Ed trainees who responded yes were not using scanning facility while only 4% participants did not respond to the question.

4.1.1.7. Access to the ICT Tools for Teacher educators

ICT tools as discussed above for the B.Ed trainees are similar important for the teacher educators to ensure the implementation of ICT in teaching and learning process. The figure 7 as given below shows the overall picture of availability of ICT tools and their usage by teacher educators. The overall result of different indicators did not show the satisfactory usage of ICT tools by the teacher educators in colleges of education and PITE.

122
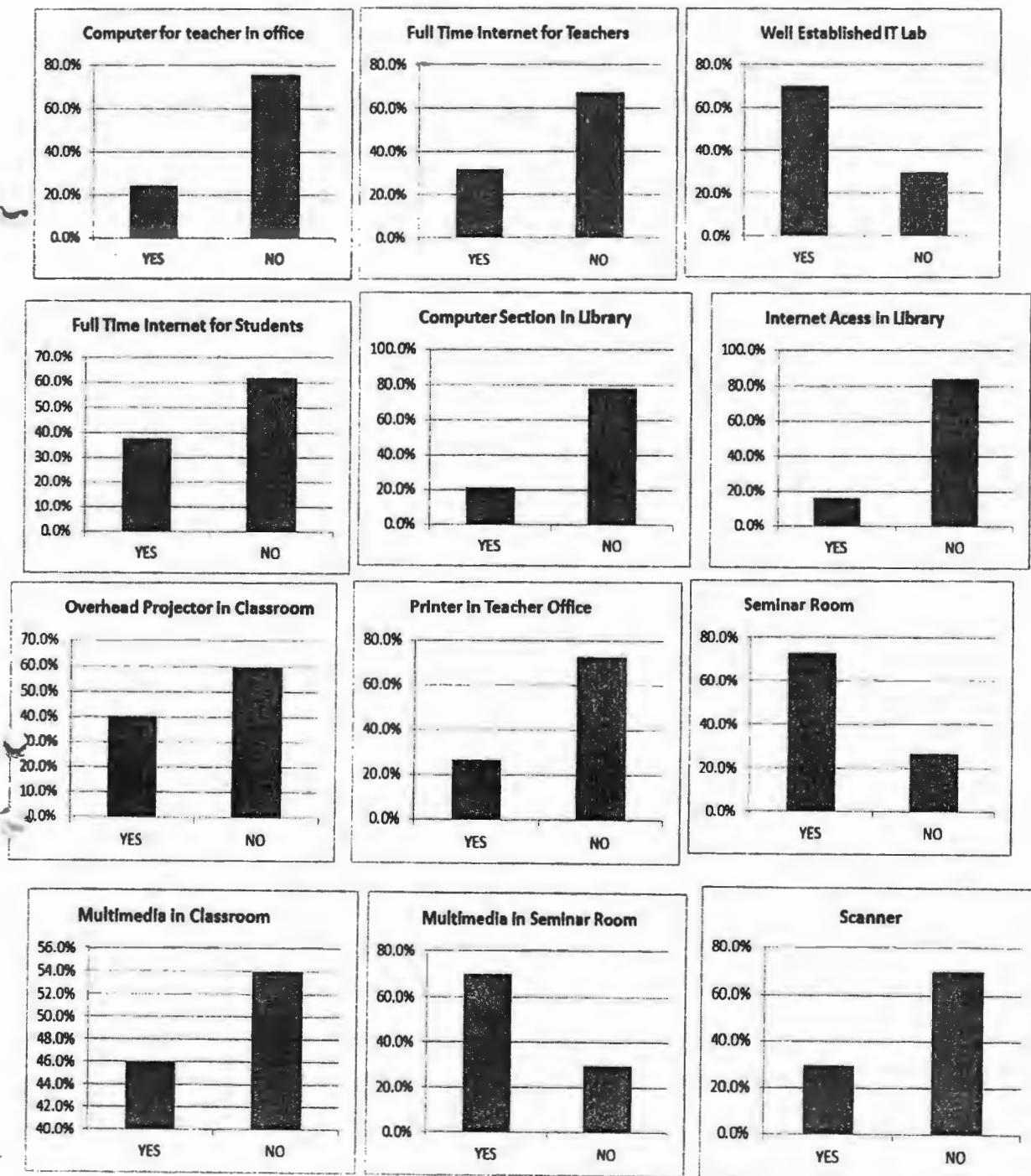
Figure 7. Access to the ICT Tools for Teachers

Teacher educators are the major stakeholders who need to have access to different ICT

tools so that they can train their students in an efficient way to utilize these tools in

teaching and learning process. During the course of study, teachers were asked about

123

their access to number of ICT tools. The researcher came to know that a large proportion of the teacher educators did not have the access to these basic ICT tools. The computer which is supposed to be in 100% access was identified by only 32% of the teacher educators.

Internet is assumed as source for building the knowledge bridge with rest of the world. However, only 35% teacher educators responded that internet was accessible to them. On the other hand only 20% teachers informed about the presence of computer section in library. This proportion of teacher educators further reduced to 18%when they responded about the internet access in the library.

Accessibility of overhead projectors and multimedia in classroom were identified by the 40% teachers. On the other hand, more than 70% teachers shared that they had seminar rooms in their institutions and multimedia were accessible there. Teachers identified the lack of accessibility of printers and scanners in their offices. Non-availability of printers and scanners were highlighted by more than 70% teacher educators.

The responses explain that accessibility of ICT tools in the colleges of education is a big challenge which further makes the learning process old-fashioned.

The lack of availability of ICT tools and their fewer usages are hindrance in the ICT-supported learning environment which also prevents active learning through technology.

4.1.2. Usage of ICT Tools by Teacher Educators

Only 25% teachers responded that there is computer for every teacher in the offices. However, a larger group used computer in teaching. Almost 14% of the teacher educators

124

responded that they were constant users of computer, 44% were found to be the frequent user and 19% of the teacher occasionally used computer in their teaching practices. It is equally interesting to know that 25% of the teacher never used computer for the teaching purposes.

Table 31. Usage of internet by teacher educators

		Internet Usage					
		C	F	O	R	N	Total
Usage of internet by teacher educators	Yes	2	2	6	1	1	12
		16.7%	16.7%	50.0%	8.3%	8.3%	100.0%
	No	1	3	1	3	17	25
		4.0%	12.0%	4.0%	12.0%	68.0%	100.0%
Total		3	5	7	4	18	37
		8.1%	13.5%	18.9%	10.8%	48.6%	100.0%

The Table 31 shows the status of access to internet and its usage by teacher educators. The results indicate that 16.7% teacher educators were using internet constantly and frequently while 50% and 8.3% were using internet occasionally and rarely respectively. However, 8.8% of had never used internet.

Table 32: Usage of IT labs by teacher educators

		IT labs					
		C	F	O	R	N	Total
Use of IT labs by teacher educators	Yes	6	9	6	2	3	26
		23.1%	34.6%	23.1%	7.7%	11.5%	100.0%
	No	1	1	0	2	7	11
		9.1%	9.1%	0.0%	18.2%	63.6%	100.0%
Total		7	10	6	4	10	37
		18.9%	27.0%	16.2%	10.8%	27.0%	100.0%

Table 32 indicates that 23.1% teacher educators were using IT labs constantly, 36.6% were using them frequently while 23.1% and 7.7% teacher educators were using IT labs occasionally and rarely respectively.

Table 33. Usage of computers in library by teacher educators

		Computers in library				
		Constantly	Occasionally	Rarely	Never	Total
Usage of computers in library	Yes	4	1	2	1	8
		50.0%	12.5%	25.0%	12.5%	100.0%
	No	1	1	3	24	29
		3.4%	3.4%	10.3%	82.8%	100.0%
Total		5	2	5	25	37
		13.5%	5.4%	13.5%	67.6%	100.0%

The Table 33 shows that out of available computers 50% were using computer section in library constantly while 12.5% and 25% teacher educators were using computer section occasionally and rarely respectively. However, 12.5% teacher educators have never used computer section in library.

Table 34: Use of Multimedia in classroom by teacher educators

		Multimedia in classroom					
		C	F	O	R	N	Total
Usage of Multimedia in classroom	Yes	8	3	3	1	2	17
		47.1%	17.6%	17.6%	5.9%	11.8%	100.0%
	No	0	1	3	5	11	20
		0.0%	5.0%	15.0%	25.0%	55.0%	100.0%
Total		8	4	6	8	13	37

126

	21.6%	10.8%	16.2%	16.2%	35.1%	100.0%

Table 34 shows that Multimedia in classroom was utilized constantly by 47% teachers who had access to it. On the other side, 12% of them did not use multimedia at all. However 18% of the teachers were frequent and occasional users among them who agreed to have access to the multimedia in classroom.

Table 35: Use of Seminar room by teacher educators

		Seminar room					
		C	F	O	R	N	Total
Usage of Seminar room	Yes	5	7	7	7	1	27
		18.5%	25.9%	25.9%	25.9%	3.7%	100.0%
	No	0	0	0	1	9	10
		0.0%	0.0%	0.0%	10.0%	90.0%	100.0%
Total		5	7	7	8	10	37
		13.5%	18.9%	18.9%	21.6%	27.0%	100.0%

The result shows that only 18.5% teacher educators were using seminar room constantly as mentioned in Table 35 while 25.9% were using seminar room frequently and occasionally. However, 25.9% of participants confirmed rarely use of seminar room and 3.7% did ever used seminar room for teaching and learning process.

Table 36. Usage of Multimedia in seminar rooms

		Multimedia in seminar room					Total
		C	F	O	R	N	
Access to Multimedia in seminar room	Yes	5	5	8	5	3	26
		19.2%	19.2%	30.8%	19.2%	11.5%	100.0%
	No	0	1	0	1	9	11
		0.0%	9.1%	0.0%	9.1%	81.8%	100.0%
Total		5	6	8	6	12	37

	13.5%	16.2%	21.6%	16.2%	32.4%	100.0%

Table 36 indicates that 19.2% respondents responded that multimedia is constantly and frequently used in seminar room while 30% confirmed occasional use of multimedia in classroom. The results show that 19.2% teacher educators were using multimedia in seminar rooms rarely while 11.3% responded that they had never used it in seminar rooms.

Table 37. Usage of overhead projector in classroom

			Overhead projector in classroom					
			C	F	O	R	N	Total
Usage of Overhead projector in classroom by teacher educators	Yes		3	6	3	3	0	15
			20.0%	40.0%	20.0%	20.0%	0.0%	100.0%
	No		0	2	1	4	15	22
			0.0%	9.1%	4.5%	18.2%	68.2%	100.0%
Total			3	8	4	7	15	37
			8.1%	21.6%	10.8%	18.9%	40.5%	100.0%

Table 38 highlights that 20% teachers had the access to overhead projector in the classroom on constant basis, 40% on frequent basis and 20% on occasional basis. The percentage of rarely users were found 15.

Table 38. Usage of printer by teacher educators

			Printers					
			C	F	O	R	N	Total
Usage of printers by teacher educators	Yes		3	3	3	0	1	10
			30.0%	30.0%	30.0%	0.0%	10.0%	100.0%
	No		0	2	1	5	19	27
			0.0%	7.4%	3.7%	18.5%	70.4%	100.0%
Total			3	5	4	5	20	37

	8.1%	13.5%	10.8%	13.5%	54.1%	100.0%

Table 38 illustrates that the overall availability of facility of printer was available to 30% out of which 30% were using printing facility constantly, frequently and occasionally. However, 10% of teacher educators who responded yes were not using printing facility for academic activities.

Table 39. Usage of scanner by teacher educators

		Scanner					
		C	F	O	R	N	Total
Usage of Scanners by teacher educators	Yes	1	1	3	2	4	11
		9.1%	9.1%	27.3%	18.2%	36.4%	100.0%
	No	0	2	0	4	20	26
		0.0%	7.7%	0.0%	15.4%	76.9%	100.0%
Total		1	3	3	6	24	37
		2.7%	8.1%	8.1%	16.2%	64.9%	100.0%

Table 39 illustrates the similar picture as of table 37. Scanning facility in the teacher education colleges is also very scarce. The results indicate 9.1 % were using scanning facility constantly and frequently while 27.3% and 18.2% were using scanning facility occasionally and rarely respectively. However, 36.4% of **teacher educators** who responded were not using scanning facility

Table 40. Usage of digital camera by teacher educators

		Digital Camera					
		C	F	O	R	N	Total
Usage of Digital Camera by teacher educators	Yes	5	2	3	1	1	12
		41.7%	16.7%	25.0%	8.3%	8.3%	100.0%
	No	0	3	0	2	20	25
		0.0%	12.0%	0.0%	8.0%	80.0%	100.0%

	5	5	3	3	21	37
Total	13.5%	13.5%	8.1%	8.1%	56.8%	100.0%

Table 40 describes that access to digital camera is also very limited for the teachers receiving training in professional colleges. OHPs, printers, scanners and digital camera are some of the ICT tools that are indispensible and unavoidable in teaching-learning scenarios. Access to these eminent pedagogic tools needs to be ensured to augment the credibility and authenticity of teacher training institutes across Pakistan. Digital cameras are as necessary tools in the modern pedagogy as the other tools. The results show that 41.7% teacher educators responded that digital camera is constantly used by them while 16.7% and 25% confirmed frequent and occasional use of digital camera for classroom activities. The results also show that 8.3% teacher educators were using rarely while 8.3% responded that they had never used it.

4.1.3. Supporting ICT Environment in Teaching & Learning

The teaching and learning environment has significant importance of teaching and learning process. The researcher tried to evaluate the level of supportive environment in the institutions where he study was conducted.

(a) ICT supportive environment for B.Ed trainees.

Table 41: Supportive environment for B.Ed trainees

Supportive Environment	SA	A	NS	D	SD	N R
Teachers are well updated in use of ICTs in teaching	25.9%	36.7%	10.9%	13.6%	6.1%	6.8%
I have enough time to prepare assignments using ICTs	21.1%	32.7%	15.0%	12.9%	10.2%	8.2%

130

I have facilities to ICTs resources at any time in the institution	12.9%	21.1%	16.3%	22.4%	18.4%	8.8%
Student learn more when ICT is used as mode of teaching	34.7%	39.5%	6.1%	5.4%	5.4%	8.8%
Multimedia tools enhance comprehension and learning	34.0%	17.7%	10.2%	10.2%	17.7%	10.0%
I hear and I forgot, I see and I remember, I do and I understand	49.0%	17.0%	3.4%	7.5%	13.6%	10.0%

Table 41 shows that Environment has an immense role in learning anything in general and in ICT specific. One cannot learn new technology and a technique until the environment is supportive. For any student, supportive comprises of teacher's knowledge facilities to access the ICTs. In addition, their perception about the impact of the supportive environment in the learning matters. Keeping this in mind, the researcher asked the trainee teachers about their perception on various aspect of the supportive environment. 26% of the B.Ed trainees strongly agreed that the teachers are well updated on the use of ICT in teaching while 37% were agreeing on the same perception. 7% student did not respond to this opinion, 6% strongly opposed the views. Availability of ample time to the prepare assignments supports students learning willingness for which 54% teacher-student shared that they had ample time while 23% showed their concerns about the availability of time to prepare assignments using ICT.

2.3   2.5   3.1   2.0   2.6   2.1

| Teachers are well updated in use of ICTs in teaching | I have enough time to prepare assignments using ICTs | I have facilities to ICTs resources at any time in the institution | Student learn more when ICT is used as mode of teaching | Multimedia tools enhance comprehension and learning | I hear and I forgot, I see and I remember, I do and I understand |
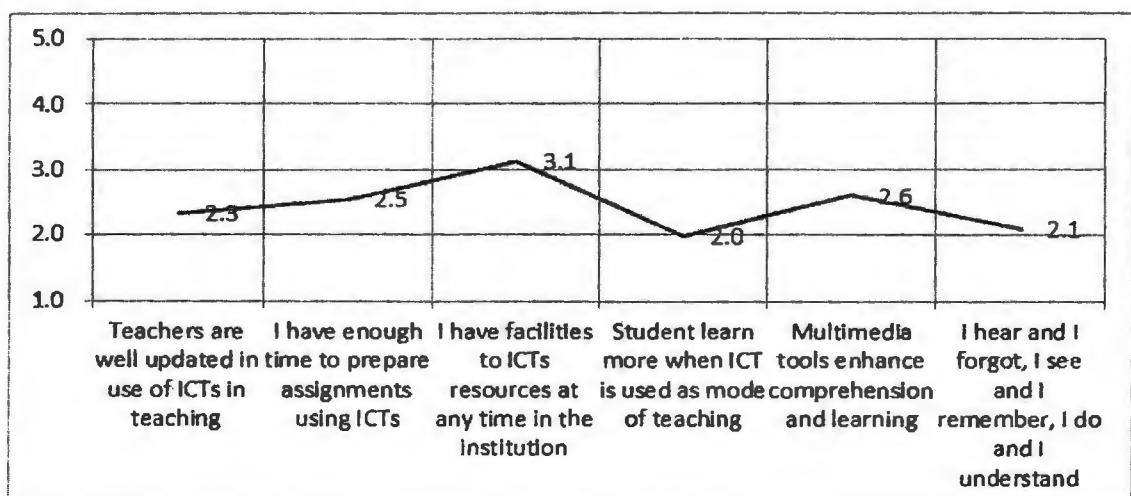
Figure 8. Perception of teachers regarding usage of ICT

On average the responses are in range of agree. These perceptions are more towards those views when there is an aim to explore the applications of ICT. On the other hand, students have perception that ICT impacts positively on their learning and understanding level.

(b) **Existing ICT competencies of teacher educators**

Table 42: ICT competencies of teacher educators

	Teachers are regularly trained in use of ICTs in teachi	I know basic computer operations	I can use application software	I can use Internet Resources	I feel comfortable by using ICTs in teaching	I feel very confident to use computer for teaching and	I have the confidence to integrate ICT in my teaching	I am skilled and confident in using ICTs in teaching – learni	I can prepare lesson plans on computer	I have PC - laptop/desktop	I have internet access at my home

	ng					learni ng		ng proces s			
SA	2.7%	51.4%	18.9%	24.3%	24.3%	29.7%	21.6%	18.9%	8.1%	37.8%	29.7%
A	29.7%	37.8%	40.5%	54.1%	48.6%	56.8%	54.1%	51.4%	48.6%	40.5%	48.6%
NS	16.2%	5.4%	5.4%	8.1%	5.4%	5.4%	16.2%	13.5%	10.8%	2.7%	0.0%
D	43.2%	5.4%	32.4%	13.5%	18.9%	8.1%	5.4%	16.2%	21.6%	18.9%	21.6%
SD	8.1%	0.0%	2.7%	0.0%	2.7%	0.0%	2.7%	0.0%	10.8%	0.0%	0.0%

Table 42 shows that the teachers have positive perception in general towards the supportive environment for using ICT in teaching and learning. In total 90% teacher educators knew basic computer operations, training need has been emerged as almost 50% teachers did not agree that they got training to use ICT in teaching and learning. Almost 75%, 50% and 57% teachers perceive that they can use internet resources and the related software. They can prepare lesson plans on computer respectively. Teachers also identified themselves as confident users through agreeing on statements "I feel comfortable by using ICT in teaching (73%), I have confidence to integrate ICT in my teaching (76%) and feel self as skilled and confident in using ICT tools (70%).

Easy and timely access to the required tools is very helpful in building and testing of new knowledge. Hence, a teacher must have access to computer and internet access. These are the major forces and support for them to implement the integration of ICT tools into their teaching practices. The responses on these tools were quite encouraging in terms that more than 89% teachers have computer and/or laptop and 79% teachers have internet access in their homes as well.

4.1.3.1. Attitude of B.Ed trainees towards Use of ICT

Table 43: Attitude of B.Ed trainees regarding use of ICT

Attitude towards Use of ICT	SA	A	NS	D	SD	N R
I regularly use computer at home	39.5%	29.3%	8.2%	10.9%	8.2%	4.1%
I prepare assignments on computer	25.9%	33.3%	13.6%	12.2%	9.5%	5.4%
Use of ICTs is very much supportive for students	44.2%	32.0%	6.8%	6.1%	5.4%	5.4%
Students show interest using ICT as teaching methodology	36.1%	34.0%	12.2%	2.0%	8.2%	7.5%

Table 43 describes that the use of ICT is perceived to be an indispensible tool by the trainee teachers. 68% teachers perceive the use of ICT as effective and use it on continuous basis. 59% teachers prepare their lesson plans using computers. 76% teachers assume that ICT is supportive in their professional career to deliver lectures effectively. 70% teacher vouched in favour of the response saying that their students show more interest if they use ICT in their teaching plans.
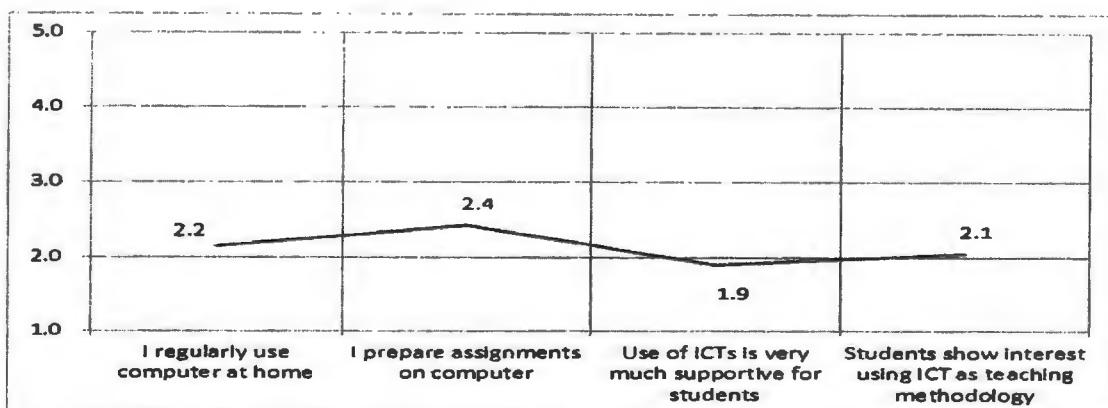
Figure 9. Attitude of B.Ed trainees towards use of ICT

134

The B.Ed trainees' attitude toward the ICT tools appears from their frequency of usage in different manners. Almost 68% student agreed while 19% of them denied using computer in their home. On the other hand, when the matter comes up on the preparation of assignments on computer, 59% students shared that they do utilize computers while working on their assignments. 14% students responded that they were unsure about this statement. Their opinion suggested their use of ICT was intermittent.

It is encouraging that students are aware of the role of ICT in their learning process. 76% perceive that it is very much supportive for them to acquire knowledge. And almost 70% of the student mentioned that students do show their interest towards the usage of ICT in teaching methodology and welcome new ideas and technology for better learning.

4.1.3.2. Attitude of Teacher Educators towards Use of ICT

Table 44: Attitude of teacher educators and usage of ICT

	Routine use computer operations using different softwares	Use ICTs based applications	Apply modern ICTs based instructional methods and appropriate tools	Identify resources to keep update in ICTs in education	Keep updated and enhance personal and professional efficiency
Confident and Explain	8.1%	8.1%	2.7%	11%	32%
Regular User	24.3%	16.2%	21.6%	30%	27%
Occasional Usage	35.1%	21.6%	27.0%	32%	16%
Little Knowledge	18.9%	37.8%	18.9%	3%	14%
Not Aware	13.5%	16.2%	29.7%	24%	11%

Table 44 shows that teacher educators are the first source of inspirations to use ICT tools in learning. Teachers' attitude and perception towards use of ICT affect their teaching process. It is clearly highlighted that teachers occasionally use different software (35%), only 8% of them are confident and feel able to explain computer operations through various software. Further, it was explored that almost 38% of them had very little knowledge about the use of ICT based applications, 22% were the occasional users while only 8% were confident to use ICT-based applications.

In addition to the usage of different ICT tools, it was further elaborated that almost 30% of the teacher were not aware of ICT-based instructional methods, 27% were the occasional users, and only 2% of them were confident about the applications of ICT-based instructional methods. Willingness to learn and grow with new knowledge makes teachers confident. This aspect also helps them to be innovative in their teaching and learning process and resource identification needs consistent attitude for acquiring and updating the information. It was encouraging that teachers perceive themselves as regular (30%) and occasional (32%) identifier of resources to keep them updated. However, it is also worth mentioning that 24% of them were unaware of different resources that can help them to update on ICT application in the field of education.

4.1.3.3. ICT skills demonstrated by teacher educators

Table 45: ICT Skills demonstrated by teacher educators

	Demonstrate advanced knowledge using technological tools for solving problems	Design and develop technology integrated student learning activities	Choose, assess and integrate tools of ICTs in instruction in the subject area	Demonstrate my knowledge using ICTs based tools to support instruction	Demonstrate skills in using word processing and applications	Demonstrate skills in using PowerPoint and applications	Demonstrate skills in using spreadsheet, data management and applications	Demonstrate skills in using print and graphic applications
Confident and Explain	13.5%	10.8%	13.5%	10.8%	13.5%	18.9%	16.2%	8.1%
Regular User	18.9%	13.5%	18.9%	21.6%	18.9%	27.0%	10.8%	18.9%
Occasional Usage	35.1%	27.0%	29.7%	37.8%	43.2%	24.3%	18.9%	29.7%
Little Knowledge	10.8%	16.2%	8.1%	13.5%	13.5%	18.9%	24.3%	5.4%
Not Aware	21.6%	32.4%	29.7%	16.2%	10.8%	10.8%	29.7%	37.8%

Table 45 shows that Demonstrating skills are the most valuable asset of a teacher. A good demonstration gives students a chance to learn by observation, which will further help them to do practically. 35% teachers occasionally demonstrated advance knowledge through technological tools followed by 22% who were not aware of the technological tools for solving problems. It is further alarming that almost 33% teachers were unaware of the technology-integrated student activities. These unawareness also emerged in

subject based teaching and learning process (30%) as they had least or no idea about instruction-based tools selection for effective ICT integration.

Word processing, occasionally (43%) and power point applications are generally demonstrated regularly (27%) by teachers. Spreadsheets applications skills were established regularly by 11% teacher while almost 30% were unaware of the spreadsheets applications. Printing and graphic designing skills were least acquired by teachers as 38% of them were unaware of those applications.

4.1.1.1. ICT skills demonstrated by B.Ed trainees

4.1.1.1.1. Basic Computer Skills

Table 46: Basic computer skills demonstrated by B.Ed trainees

	I can run programs in a computer system	I use CD Based softwares	I can organize files into a folder	I can search files in the computer system	I can copy files from CD to Computer	I can create backup files onto various media types (CD, DVD, USB, Hard Drive)	Printing a file	I can connect the various parts of the computer	I can use a scanner for copying images	I can use a Digital Camera to take photographs
Confident and Explain	29.90%	17.70%	43.50%	40.80%	34.70%	24.50%	29.90%	24.50%	23.80%	36.70%
Regular User	28.60%	15.00%	16.30%	12.20%	20.40%	12.20%	18.40%	16.30%	17.00%	16.30%
Occasional Usage	8.80%	20.40%	6.80%	16.30%	6.80%	8.80%	9.50%	3.40%	7.50%	15.00%
Little Knowledge	14.30%	10.90%	11.60%	10.20%	17.00%	17.70%	8.80%	19.70%	19.70%	12.90%

138

Not Aware	12.90%	29.30%	14.30%	12.20%	15.00%	29.90%	23.10%	26.50%	25.90%	10.90%
No Response	5.40%	6.80%	7.50%	8.20%	6.10%	6.80%	10.20%	9.50%	6.10%	8.20%

Table 46 shows that a good proportion of students had basic computing skills. They were confident and regular users of computer. Almost 60% could run programs in computer with an ability to organize files in different folders. They could search files (53%) and copy them from one destination to other (55%). As almost 40% students perceived them as confident and regular users of creating back up files in various medium, however 30% were not aware of these skills as well.

Almost 50% students had skills to take print of files and possessed the ability to use digital camera while 30% students were unaware of the skills of taking prints of files using computer with 10% unaware of using digital camera. Comparatively, scanners were used by almost 40% students with 25% students who had no skills to use it.

4.2.1.1. Word processing skills of B.Ed trainees

Table 47: Word processing skills demonstrated by B. Ed trainees

	Creating a new document file in Microsoft Word	Using simple Editing in MS-Word e.g. bold, italics, etc.	Applying Spell check in MS-Word	Inserting an image in a word document	Using Header and Footers	Setting the margin of a page	Saving a document file in different format like HTML	Creating tables in a word document	Inserting page numbers to a word document	Adding a new column to an existing table in MS-Word
Confident and Explain	46.30%	45.60%	44.20%	46.30%	31.30%	33.30%	33.30%	39.50%	40.10%	34.00%

139

Regular User	19.00%	17.70%	17.00%	17.70%	12.20%	19.00%	16.30%	15.60%	11.60%	19.70%
Occasional Usage	3.40%	6.80%	6.10%	5.40%	8.20%	11.60%	8.20%	6.10%	7.50%	8.20%
Little Knowledge	6.10%	8.20%	5.40%	9.50%	10.20%	11.60%	13.60%	15.60%	12.20%	8.80%
Not Aware	18.40%	15.60%	14.30%	13.60%	23.10%	12.90%	20.40%	13.60%	18.40%	19.70%
No Response	6.80%	6.10%	12.90%	7.50%	15.00%	11.60%	8.20%	9.50%	10.20%	9.50%

Table 47 shows that in general, students perceived themselves as skilled in word processing. Word processing applications emerged as generally demonstrated skills acquired by the students. They could create new files (65%), had ability to make minor editing (62%), could check the spellings (60%), and were able to insert images in the document (63%). The advance skills of using word processing application were comparatively less informed by students which included using header/footer (43%) with 23% unaware of this skill; setting page margins (52%), creating tables and insert new columns in an existed table (52%).

4.2.1.2. Spreadsheet skills of B.Ed trainees

Table 48: Spreadsheet skills demonstrated by students

	Inputting data in rows and columns of spreadsheet	Sorting the data in ascending or descending order	Adding few numbers of a column using formulae	Cell-referencing in a spreadsheet	Protecting a spreadsheet through password
Confident and Explain	38.1%	34.7%	35.4%	24.5%	25.2%

140

Regular User	15.6%	10.2%	14.3%	8.8%	13.6%
Occasional Usage	5.4%	11.6%	5.4%	11.6%	10.2%
Little Knowledge	11.6%	11.6%	14.3%	12.2%	8.8%
Not Aware	19.7%	22.4%	20.4%	24.5%	31.3%
No Response	9.5%	9.5%	10.2%	18.4%	10.9%

Table 48 shows that Students rated themselves relatively less skilled in demonstrating spreadsheet application. More than 20% students were not aware about data sorting, inserting new columns, cell referencing, and assigning security on specific files. On average, 35% students were confident in demonstrating different skills of spreadsheet applications.

4.2.1.3. PowerPoint skills of B.Ed trainees

Table 49: PowerPoint skills demonstrated by students

	Creating a basic presentation package	Adding clip arts within the slides	Modifying the colours of the text and lines	Introducing animation onto slides	Modifying transition between slides	Rearranging the slides within the presentation	Produce appropriate hand out formats	Using of LCD projector for presentations
Confident and Explain	38.8%	33.3%	38.1%	39.5%	35.4%	37.4%	29.3%	24.5%
Regular User	12.9%	9.5%	14.3%	12.9%	11.6%	12.2%	12.9%	9.5%
Occasional Usage	6.8%	6.8%	12.2%	6.1%	3.4%	8.8%	12.2%	12.9%
Little Knowledge	12.2%	16.3%	10.2%	7.5%	14.3%	14.3%	12.9%	11.6%
Not Aware	16.3%	16.3%	11.6%	22.4%	23.1%	17.0%	20.4%	29.9%

No Response	12.9%	17.7%	13.6%	11.6%	12.2 %	10.2%	12.2%	11.6 %

Table 49 shows that Demonstration of basic presentation skills through power point shared by the students was recorded. The respondents rated themselves as confident in this skill. They were able to explain the functions of power point presentations. They recognized themselves for creating basic presentation package (39%), adding different clip arts in slides (33%), modify colors and transition between slides (39%) and rearrangement of slides (37%).

As the respondents found themselves ineffective in the use of file printing skills, the proportion of confident users for producing appropriate handout was not as high as compared to other skills (29%), which further reduced when they identified themselves as user of LCD projectors for presentation (24%).

4.2.1.4. Internet skills of B.Ed trainees

Table 50. Internet skills demonstrated by students

	Accessing the World Wide Web using web site address	Using search engines to find information	Downloading files from the internet	Saving text and images from web pages	Sending and receiving of e-mails	Attaching files to outgoing e-mails	Forwarding e-mails to selected contacts
Confident and Explain	36.7%	42.9%	41.5%	46.9%	40.8%	38.8%	34.7%
Regular User	19.0%	12.2%	17.0%	16.3%	15.0%	12.2%	17.0%
Occasional Usage	9.5%	10.9%	6.1%	5.4%	6.1%	7.5%	6.1%
Little Knowledge	6.1%	9.5%	9.5%	8.8%	4.8%	4.8%	8.2%

142

| Not Aware | 16.3% | 12.2% | 12.2% | 8.8% | 17.7% | 23.1% | 21.8% |
| No Response | 12.2% | 12.2% | 13.6% | 13.6% | 15.6% | 13.6% | 12.2% |

Table 50 shows that the option that asked the respondents to opine on the skills of accessing the internet found impressionable responses from the concerned teachers. Use of Internet was rated as confident. The respondents also said they were regular in demonstration of this skill. They could confidently access different websites (56%), used search engines to find information (55%), download required files (58%) and were able to save selected texts and images (63%) from different web pages. Students identified them as users of emails (56%) while 42% could attach files.

4.1.2. Perception of Teacher Educators in Use of ICT

4.1.2.1. Perception regarding Teaching & Learning

The teacher educators generally agreed on the impact of using ICT on teaching and learning. They highly recognized the importance of the ICT impact in terms of learning opportunities and its efficiency. They agreed that ICT tolls have transformed the learning process and improved the quality of teaching with long term impact.
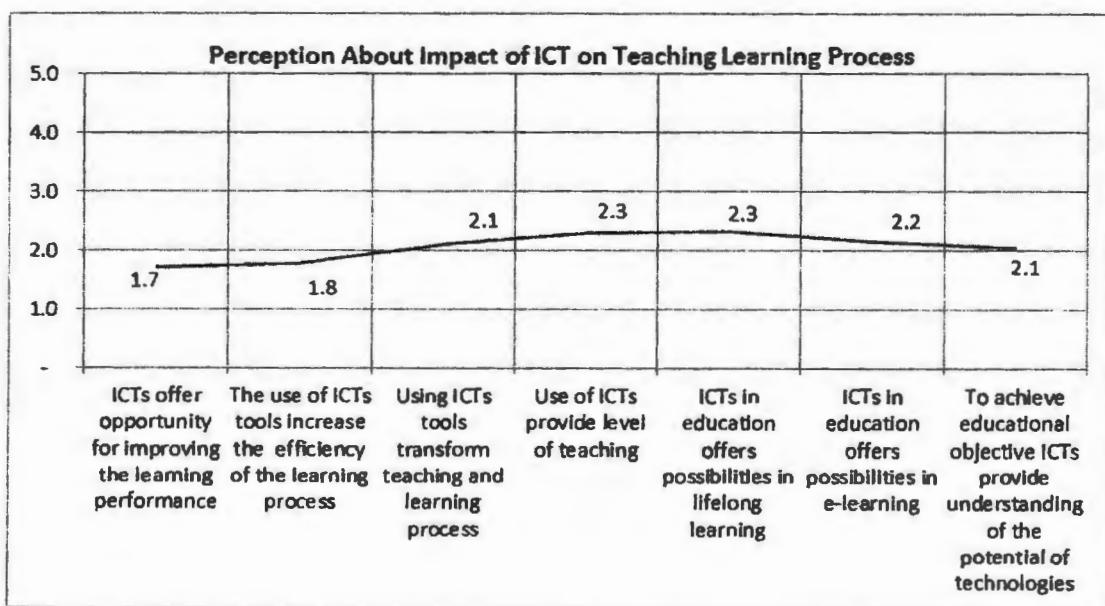
Figure 10. Perception regarding impact of ICT on teaching and learning process

4.1.2.2. Perceived Impact of ICT on Teacher's Role

With the induction of ICT, the role of teacher has emerged as facilitator; teacher has also perceived the impact of ICT on their role in the same way. Similarly, the role of student has also evolved from just acceptance of whatever delivered to active participant of learning experiences and sharing knowledge. The teachers highlighted that these will turn up to changing methodologies and instructional process in classroom. The teachers also perceived that with the increasing use of ICT in teacher education, there are possibilities of exploring newer avenues in this technologically advanced learning world.

144

Perception About Impact of ICT on Teaching Role

ICTs have changed teaching methodologies	Use of ICTs in teaching involves the mechanism of instructional process in the classroom situations	ICTs have changed the role of teacher	Using ICTs in education change the way of operation and skills of teacher	Role of teacher is to provide services & to monitor and mentor	ICTs in education has changed the role of teacher as facilitator	teacher becomes coordinator of learning experiences and students become active participants
2.24	2.32	2.14	2.24	2.27	1.95	1.95

Figure 11: Perception regarding impact of ICT on role of teacher

4.1.2.3. Demand for Integration of ICTs by Teachers

Teachers demanded the integration of ICT in teaching learning process. They strongly identified its impact on the student motivation, assisting specially those who have learning difficulties. They asserted that the demand of this skill would augment the professional tasks that teachers at training colleges are required to exhibit and provide rich learning experiences to their students. They mutually agreed that ICT on one hand increased the creativity of student and facilitated teacher in knowledge sharing and mentoring on the other.
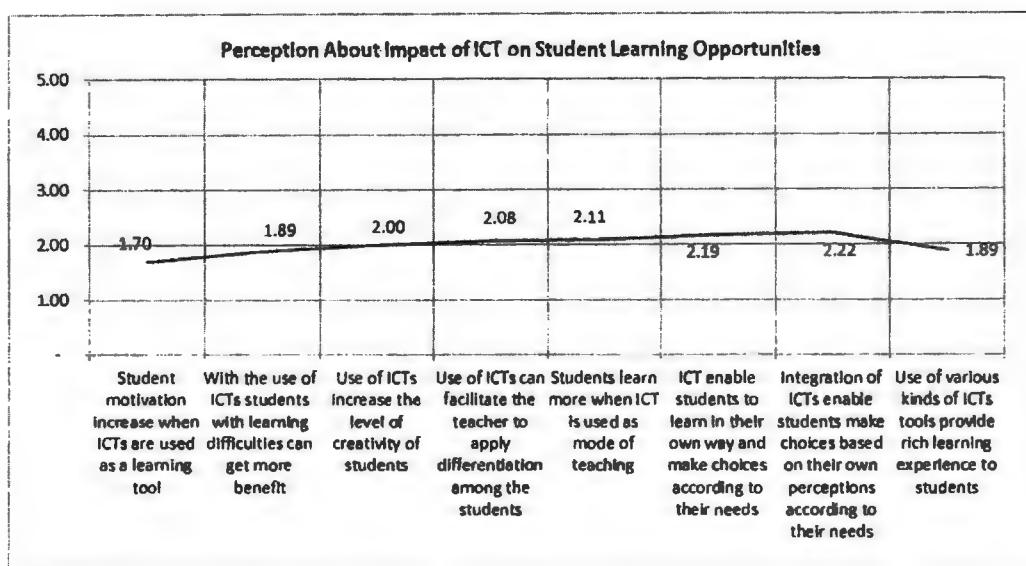
Figure 12: Perception regarding ICT impact on students' learning

4.1.2.4. Importance of Using ICT

The figure portrays the importance of ICT in teaching
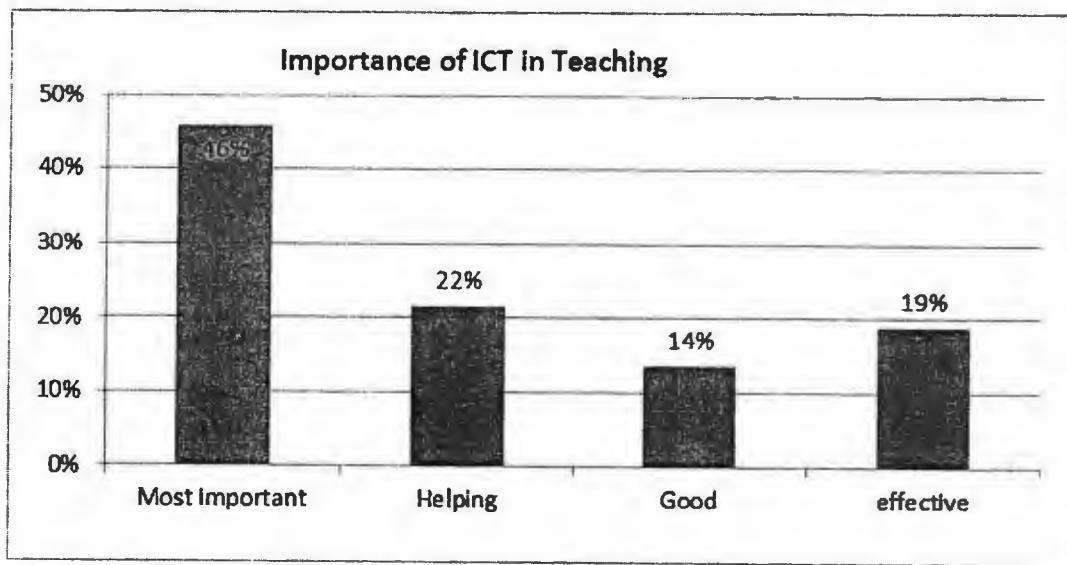
Figure 13: Importance of ICT in teaching

Both teacher's and students' acceptance of importance of ICT can make or break the situation. It will be groundbreaking to learn and implement the changing value in teaching and learning.

It was very encouraging that both of them (teachers and students) highlighted the importance of ICT in teaching practices. 46% respondents rated it as the 'most important' in teaching and learning followed by 'helpful' and 'effective' by 22% and 19 respondents respectively.

4.1.2.5.   Advantages of Using ICT in Teaching & Learning Process
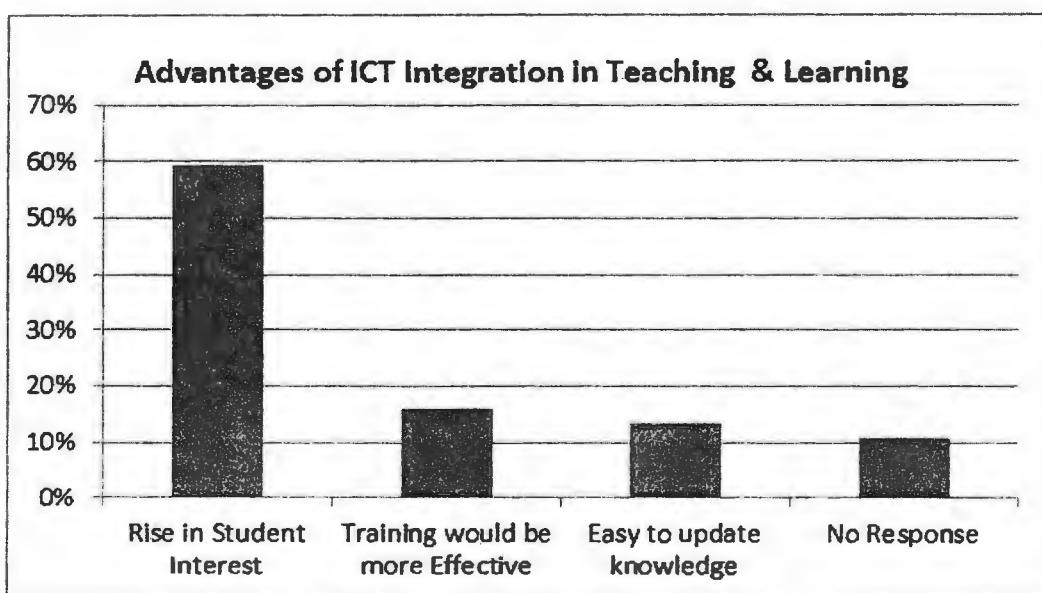
Figure 14: Advantages of ICT in teaching and learning process

Students' interest will be raised was identified as the most important outcome. On this aspect (60%) of the discussion was in favour with teachers. They asserted that ICT would certainly add advantages of to the learners if the implementation process were made effective across the professional teacher training institutions. This view was followed by

the effectiveness of training (17%) and easy accesses to knowledge (12%) were the major

advantages of ICT.

4.1.2.6. Teachers' Strength to Use ICT
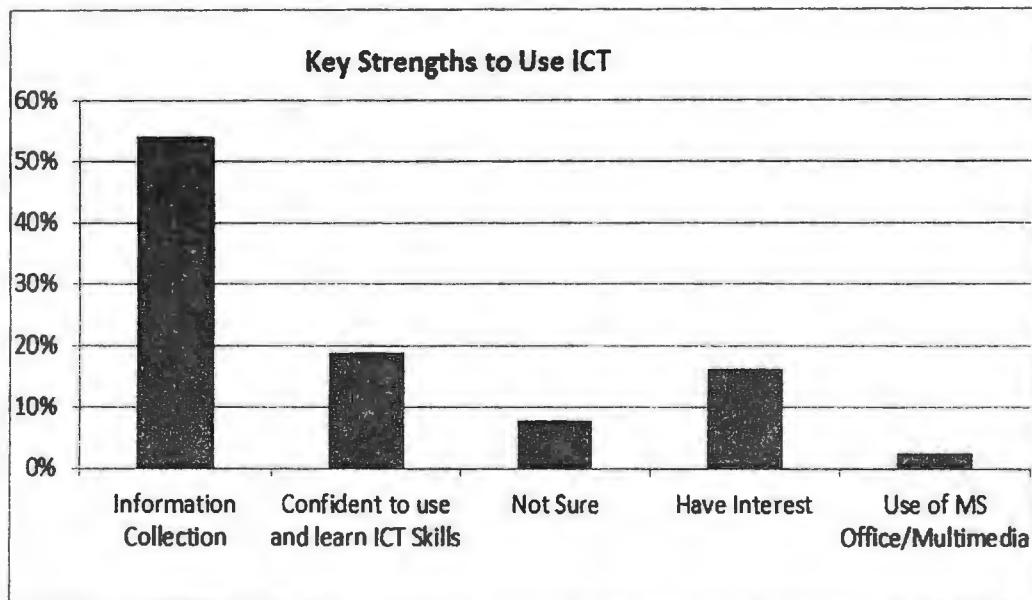
Figure 15: Key strengths when ICT is used in teaching and learning process

More than 50% teachers identified "information collection" as their key strength to use

ICT. Nearly 20% identified that they got confidence to learn advanced skills and

developed interest in subject area and the applications. They assumed that ICT was one

of the faster, reliable and valid skills that could give them an edge over the others in the

professional career.

4.1.2.7. Competency deficiencies of teacher educators
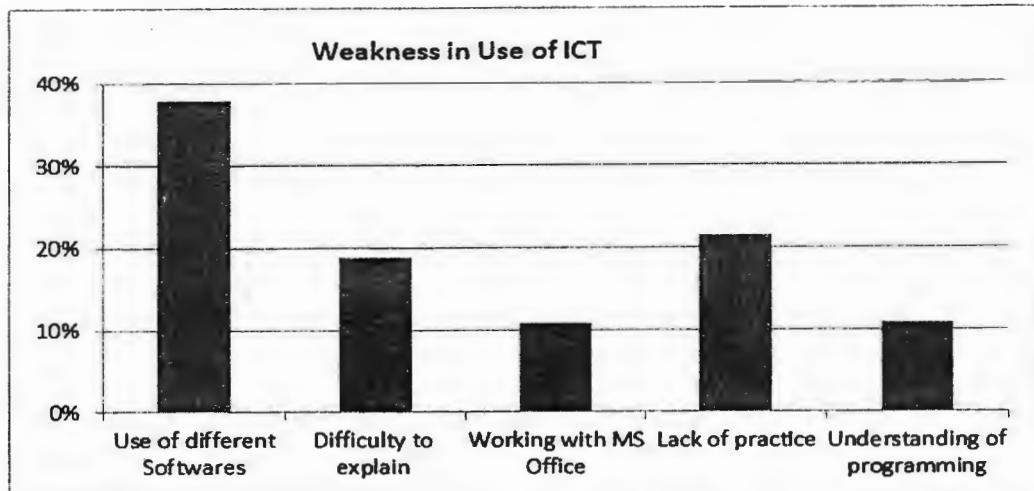
Figure 16: Competency deficiencies of teacher educators

Teacher identified that pointing the weakness will help them to work on it and to improve

the skills. 40% teacher educators shared that they had difficulty in using different

software. Up to 20% shared that ICT was not in general their use which made them feel

difficult to use and explain as well.

The analysis using Chi square

The analysis was made using the chi square as given below;

Table 51. chi square tabulation

Chi-Square Analysis for the Access and usage of multiple ICT tools for B.Ed trainees

Access vs Usage				
Indicators	sample size (n)	Chi-Square Value	P	Significance
Computer	147	25.729	< 0.000	Highly Significant

149

Indicators	sample size (n)	Chi-Square Value	P	Significance
IT Labs	147	28.102	< 0.000	Highly Significant
Internet	147	51.261	< 0.000	Highly Significant
Computer Section in Library	147	69.715	< 0.000	Highly Significant
Multimedia in classroom	147	84.686	< 0.000	Highly Significant
Seminar Room	147	57.742	< 0.000	Highly Significant
Multimedia in seminar Room	147	47.985	< 0.000	Highly Significant
Overhead Projector	147	76.932	< 0.000	Highly Significant
Printer	147	44.394	< 0.000	Highly Significant
Scanner	147	62.433	< 0.000	Highly Significant

Chi-Square Analysis for the Access and usage of multiple ICT tools for Teacher educators

Access vs Usage				
Indicators	sample size (n)	Chi-Square Value	P	Significance
Internet Access	37	16.838	0.002	Highly significant
Well establish IT Labs	37	13.75	0.008	Highly significant
Computer Section in Library	37	16.583	0.001	Highly significant
Multimedia in Classroom	37	17.771	0.001	Highly significant
Seminar Room	37	28	< 0.000	Highly

				significant
Multimedia in Seminar Room	37	18.252	0.001	Highly significant
Overhead Projector in Classroom	37	20.554	< 0.000	Highly significant
Printer in Teachers Office	37	22.296	< 0.000	Highly significant
Scanners	37	11.471	0.022	Significant
Digital camera	37	24.136	< 0.000	Highly significant

FOR B.ED TRAINEES:

There were ten different ICT tools ranged from computer to internet to the scanners and overhead projectors have been analyzed to understand the association between the access of different ICT tools for the B.Ed trainees and their usage.

The Null hypothesis is: There is no association between the access of the ICT tools and its usage.

The alternative hypothesis is: There is association between the usage and access of ICT tools.

On the basis of the chi square analysis, there is significant association between the access and the usage of the different ICT tools used by the B.Ed trainees. Multimedia in classroom appears having as the most significant (chi-square value 84.686; p-value < 0.000) association between its access and usage. The result of study shows that around 60% students have access to it, however near to 80% of them use them in their teaching learning process.

Further overhead projector is another indicator to assess the association between the access and usage by the B.Ed trainees (chi-square value 76.932, p-value <0.000) . As more than 70% of the students who have responded that they have access to overhead projector uses in their teaching learning process.

Moreover computer section in library is another indicator to assess the association between the access and usage by the B.Ed trainees (chi-square value 69.715, p-value <0.000) . As more than 50% of the B.Ed trainees who have access utilize the computers in the library.

Similar to these indicators; scanners (chi-square 62.43), seminar room (chi-square 57.742) and internet (chi-square 51.26) facilities are appeared as the significant association between their access and usage by the B.Ed trainees. Finally the results of the chi square analysis for the association of access to the computer and IT labs to their usage are 25.73 and 28.10 respectively with p-value < 0.000.

FOR TEACHER EDUCATORS:

There were ten different ICT tools ranged from computer section in library to internet to the scanners, overhead projectors and Digital camera have been analyzed to understand the association between the access of different ICT tools for the teacher educators and their usage.

The Null hypothesis is: There is no association between the access of the ICT tools and its usage.

The alternative hypothesis is: there is association between the usage and access of ICT tools.

On the basis of the chi square analysis, there is significant association between the access and the usage of the different ICT tools by the teacher educators. Seminar room, overhead projector in classroom, printers in teachers office and the digital camera were appeared as those ICT tools whose are highly significant while describing the association of access and usage with p-value < 0.000.

Multimedia in classroom (chi square 17. 77), in seminar room (chi-square 18.25) and computer section in library (chi square 16.583) were also appeared as the highly significant association between its access and usage with p-value = 0.001.

Moreover internet access and well establish IT labs are other indicators to assess the association between the access and usage by the teacher educators (chi-square value 16.838, p-value =0.002) and (chi-square value 13.75, p-value =0.008) respectively.

In addition to these indicators; scanners (chi-square 11.47) were highlighted as the significant association between their access and usage of scanners by the teachers but comparatively in lesser extent to other indicator with p-value of 0.03.

4.2. Qualitative Analysis

QSR NVIVO 10 was used for the qualitative analysis which helped to obtain the findings and results from the data collected through Focus Group discussion held with the teacher educators, classroom observation and interviews conducted with the principals of

colleges of education. The researcher explored very interesting answers and opinions regarding use of ICT in teacher education, teacher educators' perception and willingness to integrate ICT in teaching methodology and problems and challenges faced by the teachers which contributed more for this study.

NVIVO software is a tool of analysis that supports in organizing and analyzing the contents and description from unstructured data such as focus group discussions, interviews and recordings with the help of coding.

For the detail analysis of qualitative data collected through FDGs and interviews with the head of institutions, using NVIIVO, main themes, main categories and sub-categories were formed. The points discussed during FDGs and opinion of teacher educators and head of institutions, categories and sub-categories were classified to get information regarding importance of IC, role of ICT in teacher education, perception, willingness, problems and challenges with reference to integration of ICT in education. It can be seen in the following chart.

4.2.1. Analysis and Results of FDGs with Teacher Educators
Table 52. NIVIVO Themes, main categories and sub-categories

A	Role of ICT in Education	1. Importance of ICT	a. Importance of ICT and challenges in 21st century	i. Impact on teacher education and teaching methodology
				ii. Use of ICT tools in teaching
		2. Integration of ICT in education	b. Using ICT in teaching and learning process	i. Using ICT as an effective and efficient source of communication

				ii. Integration of ICT and level of integration
				iii. Difference between teaching without ICT and with ICT
B	Perception and willingness regarding use of ICT in teacher education	3. Personal and professional approach	a. Advantages and disadvantages	
			b. Conceptual and practical approach towards ICT and its usage	i. Perception about ICT and its integration in teacher education
				ii. Willingness to use ICT in teaching and learning
				iii. Competencies of teacher educators
				iv. Barriers and Fears
C	Role of teacher regarding ICT-supported instruction	4. Changed role of teacher	a. Role of teacher	
			b. Use of ICT tools in teaching and learning	i. use of ICT in teaching methodology
				ii. Importance of tools
				iii Teaching with ICT tools is effective and efficient way of learning and has impact on learning outcomes

D	Problems and challenges	5.Facilities and resources	a. Infrastructure	
			b. Resources	
		6. training and capacity building	a. Courses attended and Training needs	
			b. ICT skills and Competencies to use ICT tools in teacher education	
			c. A way forward	

The categories and subcategories are discussed below.

A. Role of ICT in Education

The first discussion point was to get the overview of participants regarding information and communication technology and its importance in education. The responses of teacher educators were divided into following sub-categories.

1. Importance of ICT

a. Importance of ICT and Challenges in 21st Century

Almost all the responses of teacher educators supported that in 21st century, ICT is the most important means for development. Therefore, the role of ICT in education cannot be neglected. As a justification, one participant stated

156

"If anyone thinks that he could survive without using ICT in 21st century, people will call him fool. Directly or indirectly, everybody is using information and communication technology. Television, cable service, FM radio, mobile, internet and computers- all these are information and communication technologies."

Highlighting the importance and challenges of ICT in 21st century, one participant mentioned.

"The time has gone when an individual was completing the task according to his own point of view. Now ICT has opened the millions of doors for new information covering different angles on same subject. Therefore, it is the requirement of time"

Similarly, all the head teachers supported the importance of ICT in its usage in many parts of life. One head teacher stated;

"The advancement of technology during last two decades has reshaped the world. I would say, due to ICT, the world is not a global village, but it is now a global room and you can find all forms of information just by clicking the buttons."

This shows that teacher educators are aware about the modern trends in teaching methodologies and they are very clear to reshape their teaching in accordance with the new modern trends of ICT.

The greater challenge highlighted by all the teacher educators and principals was the "digital divide" which may be a real threat to create larger difference between haves and have not's.

i. Impact on Teacher Education and Teaching Methodology

Teacher educators were asked regarding the change in teacher education and teaching methodology after the advent of ICT. The analysis of group discussion data revealed very

157

important and valuable information. Most of the participants except two agreed that association of ICT with education has changed the role of teachers and instructional methodologies. The advancement of technology and its frequent usage in society and education has reshaped the mode and method of instruction. One teacher educator stated:

"The important element of ICT is easy access to information, using audio-visual aids and speedy way of communication among teachers to students and students to teacher using electronic media tools. It is fact that now teaching without integration of ICT is outdated methodology with limited learning achievements and transferring fixed information."

All the teachers supported the idea of integration of ICT in teacher education. In their opinion, ICT enhances the leaning achievements of the students. One participant pointed out that;

"ICT is very important for new teaching methods used by the developed countries. It is the technology which can bring a change in our education system. You know our education system is old and we are still unable to change our teaching methodologies."

In their opinion, the role of institution is also changed not only in the services, but new structural changes and designs are the requirement of time in a way that institution may provide ICT-supported facilities and services. The opinion of two teacher educators raised some critical aspects of use of ICT such as "Does the use of ICT promote

158

creativity among the students'? Moreover, teacher educators raised the concerns related to creativity by the act of book reading. According to them, use of ICT could compromise the habits of the book reading as book reading also raises the creativity among the students. According to the teacher educators;

"ICT has disturbed the real system of education. Book reading is decreased which is directly reducing the creativity among the students. It seems that information is readymade and no efforts are being made to enhance the problem solving skills."

The decreased book reading trend was commonly discussed by the teachers but two opinions were found in this regard. According to the opinion of one group, ICT has provided very cheap, large and easy opportunities to access the information which is also available in the book forms and other teachers were of the opinion that hard book has its own impact on reader which cannot be replaced by the digital books or information available on internet.

ii. **Use of ICT Tools in Teaching**

Infrastructure and facilities are very important for the implementation of ICT in teacher education. Every participant pointed out that it was essential to implement ICT and its fair usage in education. It was basically use of sources of communication to transfer information or knowledge from one person to another person or persons. The variance in level of use and advancement is very crucial for effecting teaching to achieve the goals of education. One participant explaining the meaning of "tools" with reference to ICT stated;

"Word tool is not a new word for me. If I go back twenty years, our tools were chalk, duster and board but ICT has provided advanced, effective, efficient and communicative

159

tools to transfer the ideas or information or knowledge from single source to large

number of audiences. Therefore, using ICT tools is only change of shape, medium and

mode in the way of communication. "

In response to the question regarding usage of ICT tools in teacher education, one

participant interestingly responded highlighting the deficiency rather than as an effective

source of communication.

"We are mostly using 60 to 70%, ICT tools like multimedia, PowerPoint presentation,

overhead projector, and computer. We are more interested to use more, but due to load

shedding and non- availability of electricity, we experience problems either with teacher

or students"

All the teacher educators agreed on a point that the problem is not with the teachers and

tools, the real problem is how we can get support using ICT tools in education and how

they are effectively and efficiently supporting our teaching methodologies.

Simultaneously, a few teachers pointed out the demerits of ICT tools such as reliability

and continuity, efficiency and effectiveness. One teacher educator stated;

"It seems that I am slave of a tool and its continuity and efficiency is beyond my level of

expertise. I am just its manager and operator, but sometimes due to its functionality and

application, I am helpless. When there is electricity breakdown, I am helpless, when there

is mechanical fault, I am helpless and when there is technical problem, I feel myself

dependant. "

All the teacher educators mentioned the name of ICT tools such as computers, internet, multimedia, videos, audios and mobile. According to one participant;

"I am using power point presentation through multimedia and guide students to use Google search method to find out the material on the same topic, Microsoft documents are also used for same purpose".

Difference of opinion was found on usage of ICT in teacher education. According to some teacher educators;

"We are not using ICT frequently", other replied *"We are using fifty percent of the ICT resource. Sometime we use them and sometimes we do not, but major hindrance is non-availability of electricity and outdated equipment".*

Another teacher pointed out that;

"I agree with my colleagues that facilities and resources are not available, but it is a matter of personal interest. I am keen to learn more, therefore, I find the ways to use technology. It has given me more knowledge".

The study found great concerns regarding lack of facilities, resources and ICT supportive environment in colleges of education but most of teachers were of the opinion that even within the limited resources and facilities ICT should be integrated in teaching methodologies.

2.   Integration of ICT in Education

The second category of theme one includes integration of ICT in education. The discussion on ICT in education generated general idea of teacher educators regarding ICT and its usage for the purpose of education in routine teaching and learning process. However, the discussion lead towards the effectiveness of ICT as a source of communication, level of integration with possibilities and challenges and how teacher educators have observed the difference between ICT-supported teaching and teaching without using ICT tools and teaching methodology.

a.   ICT in Teaching and Learning Process

The question was asked regarding impact of ICT on teaching and learning process. This question encompasses following new point of discussion considering the role of ICT and its level of integration.

i.   ICT as Effective and Efficient Source of Communication

All the teacher educators agreed to the idea that the advancement of ICT and its frequent use in society has left no option to continue the old teaching methodology to achieve the goals of education. However, contradiction was found on the level of integration keeping in view the education philosophy of learning by doing and enhancement of intellectual skills of students. Every teacher accepted that ICT is very efficient and effective source of communication with very positive attributes enhancing the learning achievements. Giving example, quoting the historical location of Indus civilization, the Moen-Jo Daro, a 5000 years old city, located on the right bank of Indus river, the largest river in Pakistan ,

one participant explained the effectiveness of ICT in teaching and learning process. He said;

"The integration of ICT in teaching and learning is very important. For example: if we are studying the Moen-jo-Daro topic in Pakistan Studies subject, so through using ICT tools such as video/film we can run the program of Moen Jo Daro which means we brought Moen-jo-Daro before students. This way of learning will always be remembered by students."

The above discussion leads toward the concept of simulation and games which is very effective way to communication defining and explaining the conceptual understanding through films and games. It was found that teacher educators are more interested to use ICT tools in teaching and learning process to implement simulation and game mode of communication for comprehensive learning. According to another participant;

"If we are watching movie on Moen-Jo-Daro, we will remember it for life, but if it is explained through a lecture in a classroom we cannot remember it for a long time. Therefore, ICT provides us an opportunity to learn comfortably by using different tools and techniques which enhance the learning. Not only this, but by using ICT, we can exactly achieve what has been said in Bloom's taxonomy."

The ideas of all participants reflect the theoretical and practical understanding regarding use of ICT and its effectiveness to enhance learning outcomes. The responses indicate the Bloom's Digital Taxonomy (Churches, 2009) as mentioned in below figure;
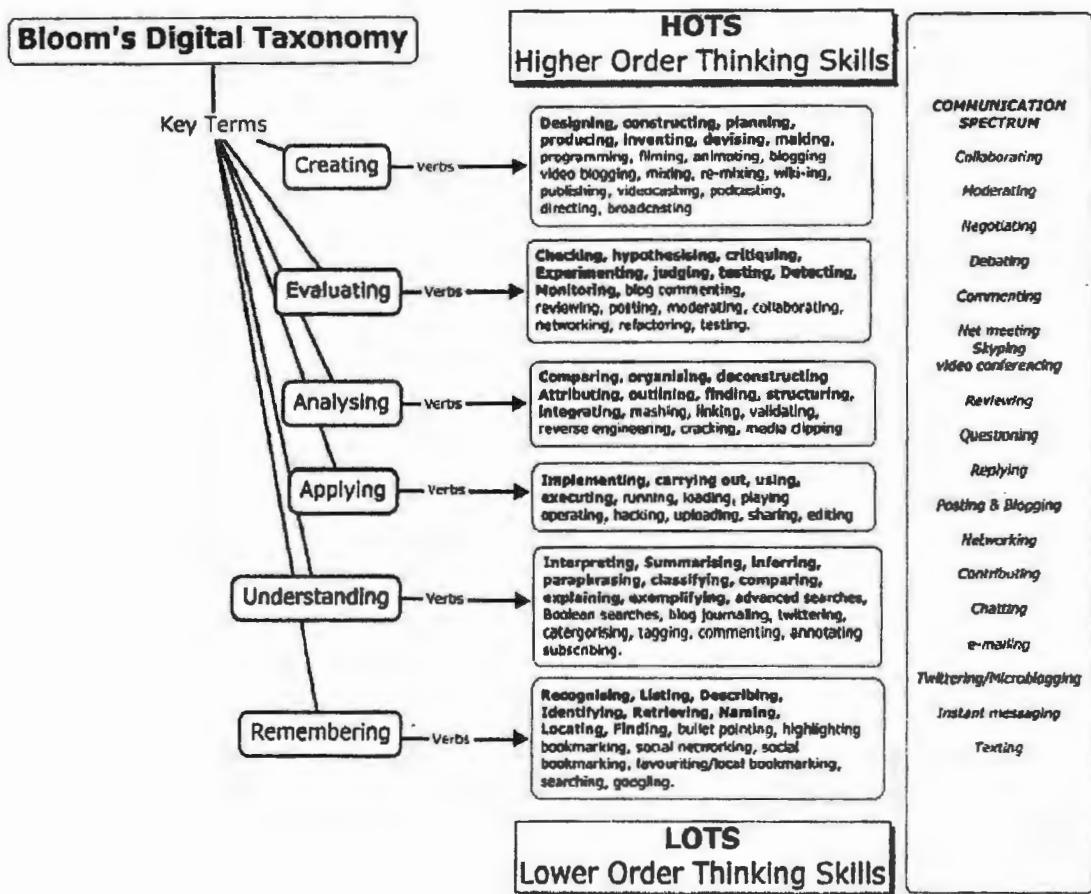
Bloom's revised digital taxonomy map (Churches, 2009)

In addition, all teacher educators emphasized that they were keen to learn more and keep themselves engaged in new instructional designs for the improvement of education system. One teacher added that;

"ICT must be integrated, particularly, here in colleges of education where we are preparing new teachers for primary education. If these teachers are trained properly using new techniques and applying new teaching methodologies, it will be very easy for them to apply in their teaching at schools level.

Most of the participants were in favour of integration of ICT in existing classroom teaching for supportive teaching and learning process. The teachers feel very comfortable to implement ICT in teaching however specific training needs were highlighted by the teacher educators.

ii.   ICT and Level of Integration

Level of integration was main concern of the participants. Their opinion in this regard was candid. They declared that education is a continual process of learning according to the requirement of students. They held the view that different educational and physiological theories are applied to achieve the goals of education.

According to their point of view, all these educational and psychological theories have been adopted after a long deliberation, research and synthesis of different teaching theories and methods. One cannot therefore; discard all the old ways of teaching from education system. Their opinion highlighted that there should be a step-by-step systemic approach to re-shape the teaching methodology applying all successful theories of education. Frequent shifts from one system to another system may be harmful particularly keeping in view the decomposition of intellectual level of student during the learning stage. One of the teacher educators explained;

"I believe that ICT is integral part of teaching and learning process, but speedy advancement is problematic in terms of frequent shift in policies which is not feasible for any education system. Yesterday we had multimedia, today we have Skype and tomorrow we will get a new tool which will be more efficient as source of communication. So is it

165

good to change the substitute source of communication replacing old one thrice in one academic year? It is very important to fix the level of integration of ICT in education and in teaching methodology in accordance with the goals of education and requirement of students according to their capacity. "

All the teachers showed concerns of "digital divide" and unequal opportunities for the world as a whole. The major issue the teacher educators highlighted was the un-equal access to ICT facilities and resources in same type of institution. They highlighted that for same curriculum to be implemented for any academics qualification must be facilitated on concept 'equal opportunities to all'.

iii.   Difference between Teaching with and without ICT

The responses on teaching without using ICT and teaching with ICT were very interesting which shows their perception and willingness to use ICT in teacher education. According to one teacher educator;

"The lecture method is forgone now. The requirement of students has compelled teacher to be more informative and knowledgeable besides the curriculum. Student is now keen to learn more in the classroom particularly to remove his ambiguities during his self-learning. "

The perception and attitude of teacher educators showed that they are mentally prepared to use new teaching methods supported by ICT and they are keen to implement it in subject to get access to ICT resources, facilities and specific trainings of ICT related to teaching methodology.

B. Perception and Willingness of ICT Use in Teacher Education

In this section, teacher educators were asked about their perception regarding ICT as a tool for teaching and learning process and their willingness to use it in their classroom teaching. This theme has following sub-categories which will define the perception and willingness of teachers towards ICT and its usage in teacher education.

3. Personal and Professional Approach

The personal and professional approach towards ICT will determine their willingness and acceptability of ICT.

a. Advantages and disadvantages

Question was asked to teacher educators about the advantages disadvantages of ICT with reference to teacher education. The discussions on both points were separately enumerated.

Almost all the participants believed that ICT has countless advantages in teaching and learning process. All the responses indicated their positive attitude towards ICT and its integration in teaching and learning process which offers large number of options for productive learning environment. One teacher education explaining advantages mentioned that;

"It is really more interesting and amazing. Before use of ICT, it was very difficult to get information on the same topic. We were only following the textbook, the only source of information. With the use of internet and ICT in teaching and learning process, it is easy for us to get more information on the same topic. Not only these, but a wide range of

167

sources are available on the internet and different angles of subject are easy to understand. ICT has made our life very comfortable".

Mentioning the benefits of ICT one participant stated "*It (ICT) makes us more knowledgeable and expert*". All the participants agreed on the point that ICT enhances quality of teaching, but besides that a few teacher educators pointed out some demerits of ICT, in terms of less usage of intellectual work to be applied by the students. One participant argued that;

"I cannot deny the integration of ICT in teaching, but there should be limitations so that students should use their mind to conclude general to specific rather than rely on the readymade available conclusions. I feel that easy accessibility of information has rusted the mind of students. Majority of the students only wish to complete the assignment rather than synthesis of their own approach and available information on the same subject."

In contrast to above perception, one participant stated;

"ICT makes easiness for teachers. A teacher also learns more. It is well- known saying that 'teacher always learns" and this idea has been very supportive with the advancement of technology, accessibility of material, and user-easy techniques to obtain the information from available resources including students. Now Students are very informative and it is very important for the teacher to get more and more knowledge on the subject to keep himself at par as compared to the students".

Another participant shows the positive perception about ICT and its integration in teaching learning process. The student says;

"ICT is very effective source of communication. Now material is available on internet and it can be easily downloaded. This facility has not only provided opportunity to the teachers, but students are very smart to get the information on same topic which is scheduled to be topic of the next class".

The summarized positive connotation are given below which were the very short responses of the teacher educators about the advantages of integration of ICT in teaching and learning process

- ICT is a motivational tool
- ICT enhances learning outcomes
- ICT is a great innovation in teaching
- ICT plays vital role in high achievements
- ICT-based learning is collaborative
- ICT-based learning is flexible
- Learning with ICT fulfils all the requirement of constructivism
- ICT creates easiness in the teaching.
- ICT-based instructions are well- understood
- ICT is an easy way of communication
- ICT is Powerful source of communication

- ICT-based access to users is not costly.

- It is a great source of motivation

- ICT helps improve the attendance of students.

Similarly for disadvantages, following pessimistic connotations were narrated by the participants;

- *Learning with ICT is too easy, so it makes mind lazy*

- *Internet and computer have reduced interest in library.*

- *Intellectual work is decreased*

- *I have found dust on books*

- *Reading habits are drastically decreased*

- *Learning is now machine-made rather than man-made*

- *Students' performance is mechanical not intellectual.*

- *Handwriting skills are deteriorated*

b.   Conceptual and Practical Approach in ICT Usage

As discussed above, this sub-category encompasses teacher educators' perception and practical approach towards integration of ICT and its usage in teacher education.

i. Perception about ICT and its integration in teacher education

The word perception has been interpreted with a number of meanings, but here researcher means how teacher educators directly or indirectly as people and professionals are

170

supporters of ICT and its integration in teaching methodologies. Perception is not spontaneous reaction of a person, but it is interlinked with the experience and existing knowledge about the subject. In this study, perception is used in terms of positive attitude of teacher educators towards the integration ICT in teacher education. Similarly, the positive attitude towards ICT and its importance will determine the acceptance and willingness to use ICT in teaching.

All the teacher educators had positive attitude for ICT usage in teacher education. The response of every participant indicated his interest to use ICT in education to availability of facilities, resources and ICT-supported learning environment. In the words of one participant

"ICT is very important for new teaching methods used by the developed countries. It is the technology which can bring change in our education system. You know our education system is old and we are still unable to change our teaching methodologies."

The perception of teacher educators was very interesting which reflected how they feel comfortable with ICT. One participant mentioned *"ICT brings certain changes in methodology and facilitates the teachers as well as students.* Other supporting this idea stated

"ICT *helps us and assists teaching learning process. It is very easy for students in learning things through audio-visual aids playing vital role to enhance the quality education among the student teachers (B.Ed trainees). ICT has made this world a global*

171

village in research and exchanging the views in less expensive way. It is my firm belief

that without using ICT, we cannot achieve our goals of education".

ii.   Willingness to Use ICT in Teaching and Learning

The above discussion on the perception of teacher educators indicates their willingness to use ICT in their teaching. They had only one apprehension about the availability of facilities, resources and learning environment. All the teacher educators were keen to learn more on ICT through refresher courses and long-term trainings. One participant said

"It is not a time now to train the teacher educators on basic skills of computer, but there should be a continual training process for the integration of ICT in teaching methodology. What I understand is there should be a built-in ICT-based curriculum alongside the lectures of teachers for making the entire practice viable and practicable. One teacher educator mentioned.

"I don't think there is any change in teaching method except using ICT tools to overcome the communication gap and way of explaining the subject. I agree with my colleagues that facilities and resources are not available, but it is a matter of personal interest. I am keen to learn more, therefore, I find the ways to use technology. It has given me more knowledge"

All the participants not only showed the willingness, but they were keen to learn more about ICT and use applications of ICT in their classroom teaching.

iii.   Competencies of teacher educators

A large variance was noted with reference to the competencies of teacher educators regarding use of ICT in teaching learning process. Those teachers who had experience of more than 10 years were reluctant to be trained on new teaching methodologies in spite of their positive perception towards usage of ICT in teaching with willingness. The opinion of some teachers indicated optimistic views that they were competent to use ICT tools, but facilities and recourses were big constraint in usage of ICT. It was found that teachers who had been working for years seemed to be comfortable with lecture method though showing the interest in teaching with multimedia. A few of them were even ready to learn computer skills from the students. One teacher educator with 18 years of experience stated.

"When any un-educated person can use all applications of mobile, when a zero literate sweeper can operate mobile, read SMSs, reply in roman text then why a teacher cannot use and utilize ICT tools in teaching. Give me any tool of ICT, brief me and observe I can confidently use it efficiently. Our problem is non-availability of facilities and resource not competencies."

iv. Barriers and Fears

The discussion on perception and willingness raised the question about barriers and fears among the teacher educators. Question was asked about the main barriers and regarding use of ICT in their teaching. All the teachers mentioned that lack of ICT-supported

173

infrastructure, lack of updated hardware and software, lack of technical support for the integration of ICT and lack of funds for maintenance of tools i.e. multimedia, printer, scanner and internet connectivity issue were common barriers in Government College of education. One participant added.

"Teachers do not have any problem to use ICT in teaching, but lack of facilities, infrastructure and resources is major hindrance. Here temperature touches 50 degree centigrade in summer and we have only 2-hour electricity supply during teaching hours. How can we integrate ICT in teaching? In my opinion lack of facilities and non ICT-supported environment is major problem."

Lack of successful ICT-based models for the training was highlighted as a major barrier by four teacher educators. All the respondents indicated that they were using ICT freely and with no pressure from the peers or the seniors. There was no systematic procedure or instructional guidelines which helped teacher educators to follow those guidelines. The deficiency was in a systems not with the teachers. Many of them also pointed out the lack of in-service trainings on integration of ICT in teaching methodology as another common major barrier.

"I have no proper ICT supported-teaching model at least telling me the minimum standards of integration of ICT in teaching, what method should I adopt, which techniques I have to use for my subject, all this is lacking here."

174

Highlighting a few competency deficiencies they felt unsecure showing a fear about lack

of technical skills to solve the recurrent hardware and software problems using ICT in

classroom. One participant said.

"Last week I prepared my lecture on PowerPoint. When I started lecture using

multimedia, after 10 minutes due to electricity breakdown I couldn't complete that

lecture. Unfortunately, my all preparation remained null and void."

The discussion indicated following major barriers in use of ICT in teacher education:

1.   Lack of infrastructure and resources

2.   Lack of ICT enabled environment

3.   Lack of in-service trainings to teacher educators

4.   Lack of technical support and maintenance of hardware and software

C. Role of Teacher Regarding ICT-supported Instruction

4. Changed Role of Teacher

The argument on 'changed role of teacher' has been an important question. The

participants were asked to share their perception on it. The different points of view were

obtained as a result of this sub-category. This category also helped researcher to design

the model keeping in view the perception of teacher educators on the role of teacher.

Ideas in support and against provided valuable information. The supporters of ICT

promoted the teaching of contents and methodology using ICT in everyday lectures. The

teachers who were not in favour argued that integration of ICT must be in accordance

with changed or modified integration of ICT. They also considered ICT-integrated classes in teacher education colleges as valuable to achieve the goals of education.

a. Role of Teacher

The question was asked regarding the role of teacher when ICT is used in teaching and learning process. The opinion of the teachers was divided between two concepts. One half of teachers supported the idea that the role of teacher is totally changed when teaching is supported by ICT tools. Whereas the opinion of the other half mentioned that the role of teacher is same, but mode and method is changed. One of the participants from the teacher educators who supported the idea of 'changed role of teacher' said;

"Before integration of ICT in education, teacher was using lecture method. Now that the teachers are using the ICT tools, their role has been decreased. Now the teacher is to provide guidance instead of transferring knowledge through verbal communication. He is now a facilitator, a mediator and a middle man who guides the student and tries to solve the problems of students. "

Supporting this idea, his colleague added by saying;

"The role has been changed in the sense that machine has been involved in the teaching as parallel to teacher"

Half of the teacher educators were of the opinion that the role of teacher is not changed. Only the mode of teaching and method of teaching are changed. The conclusion of their discussion was that now the teacher is a facilitator, trainer and guide. Not much has

- A good facilitator and instructor

- A reliable guide

- Smart mediator

- Facilitator and trainer

Similarly, connotations in favour of idea "the role of a teacher is not changed" by the participants are given below:

- Teacher was guide and supporter and his role has changed much

- I don't think so, role of teacher is same, but only mode is different

- I feel role of teacher is enhanced and improved rather than changed

- The role of teacher is same and ICT has supported it

- No change in role except use of machine as a tool

All the participants were of the opinion that ICT has supported teacher to perform his duties efficiently and effectively. They mentioned that the change has been made in the supportive medium of instruction and teacher will be more and more on guidance side. Another change is in demand in ICT skill which is now very important for the teacher.

"I think this is a generation gap which will be automatically wiped out when new teachers will come into the stream".

One participant giving these remarks added that it is fact that whatever mode or mean or role is changed but *'only change has a change'* and it is permanent phenomenon. Most of

changed except the technology. What has been changed is the teaching methodology which does not mean that the role of a teacher is changed. One more participant said:

"The role of teacher is slightly changed with applications not as a teacher. He was and he is ultimately facilitator, a source of guidance for students and keeps them on track according to the specific requirement of subject knowledge. If students want to attain subject knowledge from any external sources, they have to seek guidance from teacher according to the requirement of assessment. We cannot rule out assessment. It means students have to pass through the examination process whatever technique may be used for examination."

Supporting this idea one teacher educator added:

Initially, teacher was preparing models and man-made audio-visual aids to enhance learning outcomes. Now he has ready-made tools. There is no difference whether a tool is artistic or mechanical. Before advancement of technology, students were guided to refer to books for further reading available in libraries. Now he has open sources. Therefore, I think there is no change in the role, but yes, there is change in the mode and means".

The summarized positive connotation in favour of "changed role" are given below which were the very short responses of the teacher educators.

- A good supporter, a good facilitator and a good reformer
- Very effective and valuable.

177

the teachers were inclined towards use of technology in education with new means of communication. They thought that the means can be overcome through in-service trainings on ICT and its usage in teaching methodology.

The result indicates that technical support and trainings is requirement of teachers. The role of teacher is that of a good facilitator who provides opportunity to the students to find out the solution using ICT resources by providing favorable learning environment.

b.   Use of ICT tools in teaching and learning

In the first theme, the general perception was gauged regarding the use of ICT tools in education, but this discussion was particularly directed to the classroom practices. The previous discussion encompassed both personal and professional approach towards use of ICT tools.

i.   Use of ICT in Teaching Methodology

On the response to the question about current use of technology by teacher educators in their class room practice for the training of B.Ed trainees, most of teachers said that they were not using ICT in their classroom practice as effectively as they wished. All the participants showed their willingness to use ICT for the training of teachers, but they did not have facilities in the college. On participant commented:

"How can I integrate ICT in my teaching method when we have only one multimedia in college?"

179

All the teachers were of the opinion that the lack of facilities was the major cause of discomfort amongst teachers to use ICT in their classroom.

ii.   Importance of Tools

Importance of tools was appreciated by all the participants. In their opinions, tools like computer, multimedia, internet and access to digital information may support them, but the availability of updated resources were major hurdles for the teacher educators. One participant pointed:

"I have no personal computer in classroom, though, some computers are available in only two labs, but they are outdated."

Supporting the argument, other participants said:

"I have P-II computers in labs. How can I efficiently work with them? I do not remember any single day in my 6-year experience in this college when I was provided internet facility for a whole day during college time. The reason may be electricity break down, administrative issue, or connectivity problem. I only know that I do not have internet facility"

Most of the teacher educators showed their keenness to use at least multimedia for delivery of lecture and use of computer and internet by students for the assignments.

iii.   Effectiveness of Teaching with ICT Tools

The discussion on the point 'impact on learning outcomes' all participants accepted that using ICT tools enhances the learning outcome of students. In addition, they mentioned

180

that teaching using ICT tools was very supportive in classroom for all types of learners. One participant quoted famous saying "I hear and I forget. I see and I remember. I do and I understand", all three ideas are applicable when ICT tools are used in teaching and learning. In the response of question which has impact on learning outcomes, following connotations came out from the discussion. The discussion concluded that the following equipments and resources were indispensible to continue teaching at professional teacher training colleges:

- Multimedia, internet and videos

- Television and radio

- PowerPoint presentation, MS office package

- Mobile, multimedia and video conferences

- Internet, e-libraries, Google searches

- MS excel, power point, and word

- Multimedia and internet

- Multimedia, internet and mobile

The teacher educators' point of view was in support to use ICT tools in classroom practices with justification that learning achievements are enhanced when information and knowledge were shared and communicated or transferred to students.

D. Problems and Challenges

This section of study covers the result of responses by participants regarding problems and challenges faced by the teacher educators for the integration of ICT in teacher education program. To investigate the problems, challenges and possible solutions,

181

participants were asked about main barriers they encountered to use ICT in classroom teaching for B.Ed trainees. The discussion was concluded into two following sub-categories.

5. Facilities and Resources

As far as problems and challenges were concerned, the emphasis of discussion remained on ICT-enabled environment with reference to infrastructure facilities and access to resources, i.e. computers, multimedia, devices and other tools required for ICT-supported teaching in government colleges of education. The details of infrastructure and facilities can be seen at APPENDIX F

a. Infrastructure

Strong consensus was found among all the teacher educators regarding lack of infrastructure facilities as major challenge which is a real hindrance for the implementation of ICT in teacher education program. They mentioned that they did not have such classroom settings which facilitated ICT-enabling environment. In all colleges of education, only one multimedia was available and teacher educators were right to object being put in conditions that were deplorable and inconvenient. They were of the opinion that they could not be facilitated to use multimedia in classroom. One participant said

"Use of ICT in education by teacher or lack of trainings is not a major problem because it facilitates teachers, but major problem is lack of facilities, infrastructure and equipments."

182

Supporting his colleagues, one teacher educator added:

"The major problems are lack of infrastructure facilities and non-availability of standby generator. Here, we have electricity for only two hours. It is therefore impossible to implement ICT in teacher education. All the ICT tools will be operative when power supply is there. Without power supply, multimedia and computers are just boxes for me."

It is not wrong to say that competencies of teacher may also be a major problem with reference to the integration of ICT in teacher education in colleges of education, but when teacher educators are not facilitated to provide ICT-supported infrastructure, it is difficult to estimate the level of competency deficiencies among the teacher educators.

b.   Resources

The point was discussed with regard to physical and human resources in the colleges of education. The result of the responses indicated lack of resources for usage of ICT in teaching and learning. The summary of responses given below states that the following aspects require immediate attention to resolve the issues:

- Non-availability of advanced computers
- Non-availability of multimedia for each classroom
- Non-availability of computer for each teacher educator in his/her office
- Non- technical human resources and funds for maintenances of equipments

- Internet access to teachers

- Lack of proper training mechanism for teacher educators on emerging teaching methodologies

The summary of the responses by participants on infrastructure facilities and resources were shared by one participant saying;

"Lack of well-equipped computer laborites and digitalize classrooms, internet facilities for both teachers and students and electricity are major hindrance in use of ICT in teaching and learning".

All the participants referring infrastructural issues complained that the condition of computers available in the college were very old (P-II & P-III) and they had to face technical problems. Therefore, computer labs increased their fears and teacher educators felt uncomfortable during class. Lack of insufficient space in classrooms and unreliable equipments also interrupted their teaching process.

6. Training and Capacity Building

Continuous training on integration of ICT and capacity building of teacher educators has been very important factor affecting the education process. This sub-category encompasses the formal courses attended by teacher educators, the teacher educators' ICT skills and existing competencies to use ICT in classroom teaching.

a) Courses Attended and Training Needs

Most of the participants had attended formal courses on use of ICT in teaching methodology. They informed that intermittently, teacher educators of different subjects

184

were nominated for different training program. The training programs were offered either by donor agencies under some projects and by government as a regular in-service programs for the capacity building of teacher educators on new teaching methodologies including integration of ICT. Around fifty percent teacher educators had done diploma courses either in ICT or computer application from local institutions.

b) ICT Skills and Competencies to Use ICT Tools in Teacher Education

In spite of trainings and in-service courses, they emphasized to receive more specific training courses in ICT and its integration in teaching to face the challenge in the implementation of ICT in teacher education program. Almost all the teachers were interested in pedagogical techniques instead of training on basic skills of computer to enhance their ICT-enabled teaching skills and professional capabilities. According to one of the teacher educators:

"It is not a time now to train the teacher educators on basic skills of computer, but there should be a continual in-service training process for the integration of ICT in teaching and learning. In addition, what I understand is there should be an in-built ICT- based curriculum. There should be more options to teach through ICT-based models of teaching and delivering the course content particularly for the B.Ed trainees who are the future of nation building."

The respondents highlighted that they were keen to use ICT in teaching, but due to different problems and issues, they were unable to use ICT tools in their classroom. One participant said:

"We feel very scared when some students ask about lecture on PowerPoint presentation and usage of other tools to enhance their knowledge. I have observed many students are fond of learning with new techniques, but unfortunately, we cannot fulfill their demands".

All the participants showed interest mentioning that there was no issue of skills with them. They also emphasized that they were willing to learn things for the betterment of their students. They were not only ready to manage the professional pressures and complexities, but also envisioned that once they were trained effectively, they would be able to retain their professional vigor and self-reliance. They were keen on learning new technologies that required training and professional competence. In the concluding remarks, they emphasized that:

' For God sake, government or any other agency should take us out of this mess and equip us so that we could follow the required patterns of teaching which is very important for 21st century competition "

c)   **A Way Forward to integrate ICT in teaching and learning process**

Most of the teacher educators were confident to use ICT in teaching learning process. The opinion of participants indicated their perception and willingness to ICT in

classroom teaching using ICT tools, though two different opinions were observed among the teacher educators on the need of trainings. One group of participants was in favour of continuing the specific training courses related to the pedagogical part of the training with reference to ICT and usage of tools for delivering lesson plan in the classroom. The other group of participants was of the opinion that training should be continual process with specific requirement of ICT integration and emerging teaching methodologies. In both the cases, the will to use ICT was found strong but subject to availability of resources enabling ICT-supportive environment for the integration of ICT. The suggestions and recommendation given by the participants for this sub-category are very important and elaborate. Therefore, important considerations from the participants are given below:

- Technology must be integrated in teaching, but the policy implementation should be across the board. I think there should be a proper policy; mechanism and training cycle on any ICT-based model so that all the teachers should adopt a single way of teaching in similar type of institutions where examination mechanism is the same.

- Before the integration of ICT, all facilities and resources should be provided for both the teachers and students and teachers may be trained on new teaching methodologies

- Way forward is, support by the government and other agencies to improve the infrastructure and facilities so that we should not face problems in implementing new techniques in teaching

- When electricity is not available, how other reforms may work, so please put emphasis on the power generation capacity with the available means.

- Provide physical infrastructure, facilities and resources in for fundamental requirement of ICT teaching.

- There should be proper modeling and teaching mechanism

- Teachers have no problem to use ICT in teaching, but lack of facilities, infrastructure and resources is major hindrances. Therefore, they should be removed.

- Full standby generator should be provided so that our work may not be terminated during the class.

- At least 08 classrooms must be digitalized with all facilities for both teachers and students.

- The only way forward is to provide all required facilities to sustain ICT- based teaching learning environment

- Full support of government and administration must be ensured

- We are ready to work. There should be proper procedure to give us assignments.

- There must be more seminars for awareness about ICT and its integration.

- More training is required.

- There should be proper follow up of trainings.

- Comprehensive usage of tools and teaching methodologies should be given priority.

4.3. Analysis and Results of Interviews (Head of Institutions)

Individual interviews were conducted with the principals of three colleges of education and Director General of PITE. Data was analyzed using NVIVO. Main themes were prepared and extracted. The analysis of responses of Head of intuitions (Principals) comprised four major themes:

1. Role of ICT in education and Challenges in 21st century

2. Capacities of government colleges of education to support ICT-enabling environment

3. Perception and willingness of teacher educators regarding use of ICT in teacher education program &

4. Administrative Problems and challenges

4.3.1. Role of ICT in Education and Challenges in 21st Century

All the heads of four institutions who were interviewed accepted the fact that there was no option to adopt new teaching methodologies to face the challenges of 21st century. The common perception was found regarding the important role of ICT in education and emerging new teaching methodologies for teaching and learning process using ICT tools in the process of education to achieve the goals of education. One principal stated:

"We cannot argue or rule out the integration of ICT in education. The role of ICT in education as well as its advancement has compelled us to adopt new ways of teaching. I would say it is beyond our control to restrict ourselves to follow the old pattern of teaching in 21st century when the world is considered as global village."

189

All the heads of institutions supported the idea of integration of ICT in teaching and learning process. In addition, they argued that for teacher training institution, use of ICT is very important because we are training teachers who teach in their respective schools. If they are aware about new technologies in future, this training will keep them ready to integrate ICT at primary school level. According to responses, all principals expressed their views not only in favour of integration of ICT in education, its role and importance, but they highlighted that integration of ICT has opened new doors for quality education and competitive environment at all levels. Therefore, we have to move ahead and remove digital divide. One participant responding the question mentioned:

"Speedy advancement in technology and its use in social and educational arena are great challenges in every sector including education. The big challenge of 21st century is how to go parallel with the advancement of ICT and its increasing role. Another challenge is equal distribution of resources and fair accessibility to everyone to provide opportunity to all to compete in this global village."

One principal mentioning the importance of ICT in teaching and learning process added:

"Integration of ICT should be integrated at policy level. We are responsible to train the teachers for future and want to implement usage of ICT in every subject. This is not our wish, which is need of time."

The consensus was found among all the participants on CT and its integration for teacher education emphasizing *"integration of ICT is strengthening character of quality*

190

education and improved instructional methodologies". They were focused to develop ICT-based models, develop feasible plans and strategies to enhance the quality of instruction to overcome the challenges faced by the colleges of education particularly in terms of infrastructure and lack of recourses.

4.3.2. Capacities of Government Colleges of Education to Support ICT

On the question regarding the capacities of colleges of education/ institution, except DG PITE, all the heads of institutions complained about lack of physical facilities and non-availability of resources for ICT-supported environment. They provided details of colleges covering physical facilities and resources available in these colleges which are responsible for pre-service teacher training institute in the province. Initially, these colleges were offering PTC and CT courses besides bachelor degree in education. In 2010, PTC and CT courses were replaced with two-year Associate Degree in Education with the support of PRE-STEP project funded by USAID. As discussed above, the situation of PITE was different with respect to colleges of education. PITE was established as a provincial institute for pre-service and in-service training programs of primary and high school teachers of Sindh.

As compared to the colleges of education, PITE is well established institution with sufficient facilities and digitalized computer classrooms. The role of PITE has remained dominant in teacher education. From 2004- 2007, all the colleges of education and government elementary colleges in Sindh province were placed under the umbrella of

PITE instead of Bureau of Curriculum , that is the current operating authority of colleges of education. The details of institutions, physical facilities and availability of resources can be seen at APPENDIX F.

4.3.3. Perception of Teacher Educators & Use of ICT in Teacher Education

On the third theme, perception and willingness of teacher educators, the responses of head of institutions were very positive, but differed a little as compared to the responses of teacher educators. Two principals indicated that 75% teachers were keen to use ICT in instruction, but remaining was reluctant to use ICT in teaching and learning process. One principal stated:

"It is a fact that young generation is very keen to use ICT in teacher education and they are very much interested to use new emerging teaching methodologies, but those teachers' who have spent their 20 years on one teaching methodology and they retain information of subject on tips, they feel shy to use ICT tools in teaching and learning process. The reason may be their inadequate computer skills or fear to use ICT in teaching and learning".

The Administrative in charge of academics, PITE, praising the efforts of teacher educators said:

"I appreciate the efforts of young teachers who are keen to learn more and more particularly about emerging teaching methodologies with integration of ICT. Fortunately, we have standby generator, digital classroom and all facilities including

192

ICT-enabling environment here and teacher educators are fully utilizing these services

provided by PITE to enhance their teaching skills"

When they were asked about the reasons, they mentioned that most of the teachers in this

group were those teachers who had less than five years in their retirement. Therefore,

they were reluctant to integrate ICT in their teaching because they were comfortable with

the lecture method. Another reason is lack of computer skills among those teacher

educators. They supported teacher educators' idea that they were ready to use ICT in

instruction, but lack of facilities and resources were the main hurdles.

4.3.4. Administrative Problems and Challenges

The last theme was the administrative support by institution highlighting problems and

challenges faced by the head of institution. Except PITE, all the respondents of this study

were not satisfied with the physical facilities, resources and internet service. Almost same

issues were highlighted by the principals of colleges of education. The Administrator In-

charge PITE indicated satisfaction with regard to physical facilities, resources and in-

service training programs completed by the teacher educators posted in PITE. The

summary of issues and challenges are given below:

- Non-availability of well-established computer rooms

- Non-availability of multimedia for each classroom

- Non-availability of high-tech computer for teachers and students

- No full day internet accessibility due to power breakdown for many hours

- Lack of ICT- based models for training of B.Ed trainees

- Lack of technical and financial support by authorities

- Non-availability funds for repair and maintenance of computers equipment

- Insufficient ICT tools, i.e. multimedia, laptops, computers, UPSs, power generators, etc

4.4. Analysis and Results of Classroom Observations

The researcher observed four classrooms in natural settings as a passive observer to evaluate the integration of ICT in colleges of education. The permission was obtained from the principal of college and consent was accorded by the concerned teachers. In Government College of education Sukkur, the following subjects in the classrooms were observed by the researcher;

1. Educational Technology

2. Educational Measurement & Evaluation

3. Teaching of physics, and

4. Environmental Information Technology in Education

The purpose of classroom observation was to (i) assess the existing capacities of colleges of education in terms of facilities, resources and classroom environment, (ii) evaluate the classroom practices by the teacher educator with reference to integration of ICT in teaching and learning process, and (iii) estimate the use of ICT tools in classroom practices.

The analysis presents findings of classroom observations with reference to integration of ICT in teaching and learning process. The comments are offered on the following categories:

4.4.1. Classroom Environment

The researcher was interested to observe the classroom environment in terms of availability of ICT Tools and digitalization of classroom. The setting of classroom was not digitalized. In all the observed classes, the researcher found that teacher educators entered into the classroom but there was neither a computer in classrooms nor had the teachers prepared a lesson plan to deliver it on multimedia or in a computer-assisted classroom. In all the cases, teacher used lecture method. One way communication was observed in all the classes.

4.4.2. Teaching Method

The interest of researcher was to explore the existing methodology for the delivery of lesson plan and classroom activities using integration of ICT in classroom teaching. Only lecture method was used for the class. It was observed that only teacher was transferring one way information to the students. No activity method was observed in any class. The researcher noted the distraction of teacher from topic when any questions were asked by the students. It was observed that the class teacher was simply 'telling the story to students' rather than using any teaching method during class based on activities being performed by students.

4.4.3. Use of ICT Tools

There was neither a computer in the classroom nor any ICT tools used by the teacher educator for delivery of the lesson plan.

195

4.4.3.1. Use of Instructional Materials: Websites and Audiovisual Materials

Nothing was applicable for research to any class with reference to use of any instructional material.

4.5. Characteristics of ICT supported initial teacher training model

The proposed ICT supported training model developed for initial training of teachers has very important uniqueness as compared to the traditional teaching methodology. Integration of ICT in instruction and use of ICT tools for communication represent new classroom environment in order to assess relationship presented in the model based on flexibility, interactive approach and collaborative method.

Table 53 shows the ICT tools used for application of model and relation among educational attributes.

Table 53: ICT tools used for pilot testing of model

	Teacher Educator Content	Teacher Educator Instruction	B.Ed trainee As learner	B.Ed trainee Content	B.Ed trainee face-to-face

Multimedia	Interactive Flexible Collaborative	Interactive Flexible Collaborative	Interactive Collaborative	Interactive Collaborative	In person
Website	-	-	Interactive Flexible	-	-
SMS Chat	Interactive Collaborative	In person Interactive Collaborative	In person Interactive Collaborative	Interactive	Flexible
Email	Flexible Collaborative	Interactive Collaborative	Interactive Flexible Collaborative	Interactive	Flexible
Video Conferencing	Interactive Collaborative	Flexible Collaborative	Interactive Collaborative	Interactive Collaborative	Collaborative

4.6. The existing current status of teaching methoddology
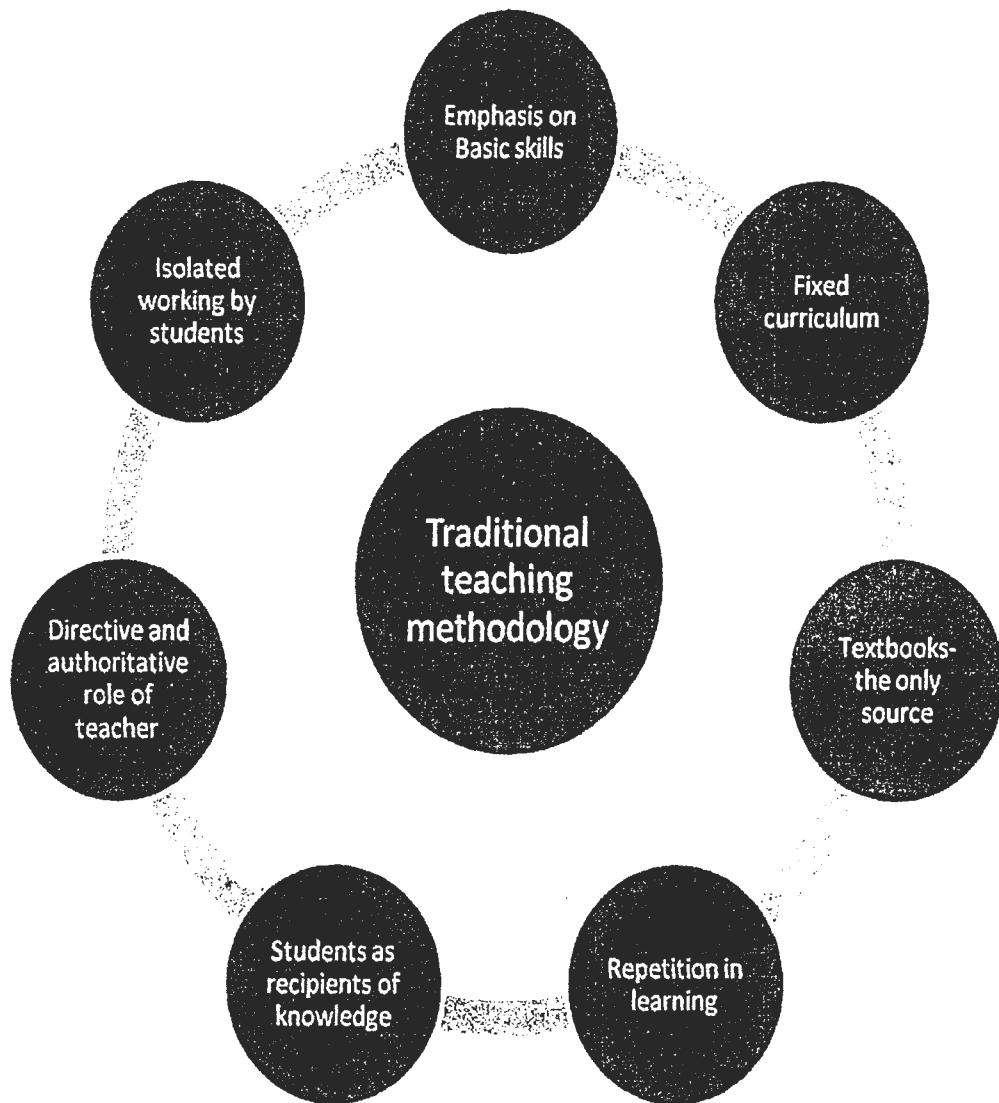
Figure 17: The Current Teaching Methodology in Teacher Education

The figure 17 shows the current status of teaching methoddology used by the teacher

educators for pre-service program. The model elaborates the conventional practices and

has no emphasis on the ICT-based innovations in the teaching and learning scenarios.

The students remain quiet during the lecture and passively attend the classes. They repeat

the contents rather than explore them through technology-assisted environment of

learning.

4.7. The Proposed ICT-supported Model for Teacher Education
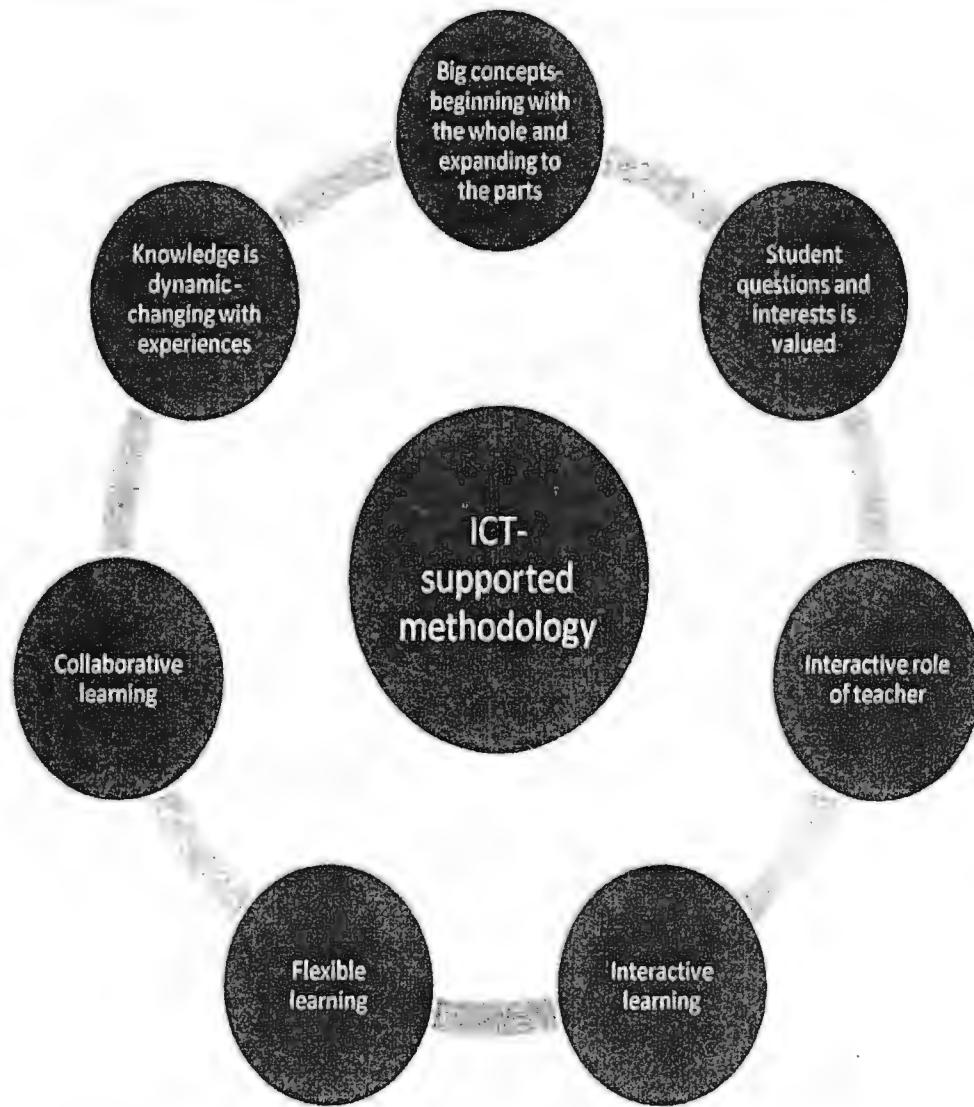
Figure 18: ICT-supported Proposed Model for Teacher Education

Figure 18 shows the proposed teacher training model. It elaborates how the students can benefit from the ICT environment in the class. Teaching and learning both remain flexible. The learners need to focus on the active contents rather than the conventional textbooks only. There is interaction in the class. The learners share their experiences. This way, the learning is more independent and collaborative. Everyone enjoys learning.

The extension of the proposed model has been shown in Table 54.

Table 54: The extension of ICT supported teaching model

Institutional capacity	Personal and Professional	Pedagogy	Innovation in Teaching and Learning	Usage of ICT Tools
The institution	*The teacher Educator*	*The classroom*	*Learning theories*	*Digital classroom*
- Infrastructure development - Collaborative learning environment - Innovative practices - Policy reforms	-Competencies to use ICT tools for instructional tasks. -Personal and professional development - Digital Literacy	- Integration of ICT in instructional practices - Problem Solving-content, educational objectives, life-long learning - Knowledge creation through self	- Learning theories models - Learning outcomes based on learning models - Innovations in teaching methodology - Lesson planning	- Classroom environment - Use of multimedia - Presentation on PowerPoint - Internet - Email - SMS

		learning and management	for learning achievements	
				.

The table 54 shows the overall picture of teacher training model in terms of theoretical concept and requirement for the implementation of model.

4.8. Data Analysis of Tryout of Model

Total 65 questionnaires and evaluation forms were filled by the B.Ed students.

For quantitative analysis, percentage was obtained to analyze the responses of students to the questionnaire. For qualitative analysis, data was collected through FDGs and evaluation from. Mixed method was used to identify the integration, appropriateness and efficiency of ICT supported instructional model, appropriateness and efficiency in using ICT tools for instructions and problem solving, and cost effectiveness of ICT-supported teacher training model.

4.9. Results of Tryout of Model

The results of the analysis are presented in the tables below:

To answer the above mentioned question and its subsequent sub- questions, B.Ed students were asked to respond to the statements and acceptance level of integration of ICT in teaching learning process and use of additional resource for learning

achievements. The main objective of this section was to identify the views of students on the components of proposed ICT supported model.

Table 55: Acceptance level of integration of ICT by B.Ed students

S. No.	Statement	SA	A	NS	SDA	DA	Total
1.	ICT supported instruction creates conducive learning environment	45	14	1	1	4	65
2.	The use of multimedia supports effective learning	52	12	-	-	1	65
3.	World Wide Web is very effective additional flexible source of learning	34	24	5	1	1	65
4.	Use of SMS Chat creates interactive and collaborative learning environment among learners and the teacher educator	22	26	5	4	8	65
5.	Use of SMS Chat creates interactive and collaborative learning environment amongst	58	4	2	-	1	65

	learners						
6.	Use of email creates learning environment collaborative, interactive and a flexible for students	12	32	10	4	7	65

Table 55 shows that out of total 65 respondents, 45 strongly agreed and 14 respondent agreed that 'ICT supported instruction creates conducive learning environment'. The results show that 64 students supported that usage of multimedia is very effective in learning. Total 46 out of 65 respondents agreed to the study for 'the Use of SMS Chat creates interactive and collaborative learning environment among learners and the teachers'. Similarly, 62 respondents agreed that 'Use of SMS Chat creates interactive and collaborative learning environment amongst learners'. However, 44 respondents supported that 'use of email creates learning environment collaborative, interactive and a flexible for students'.
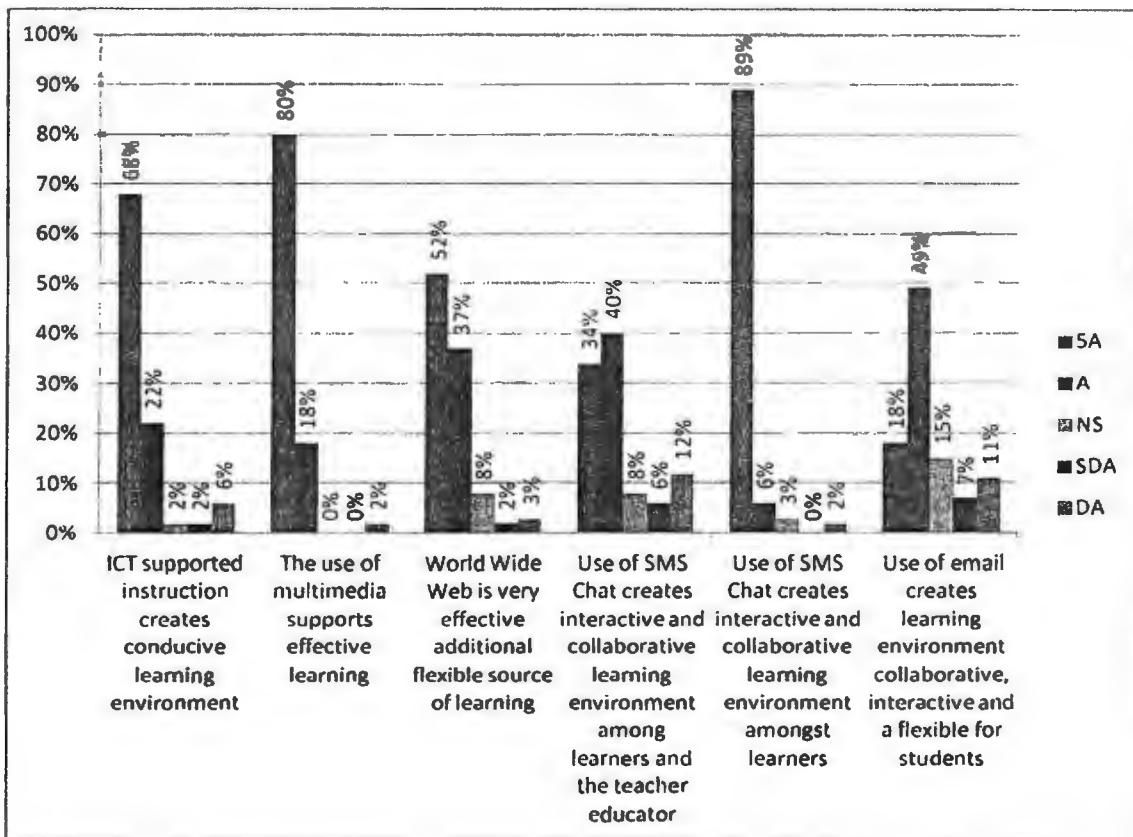
Figure 19: Responses of B.Ed trainees regarding use of ICT tools

The figure 19 shows that 68% B.Ed students are highly comfortable and 22 % are comfortable with ICT supported instructions. The result shows that 91 % students believe that integration of ICT in teaching and learning process creates conducive learning environment. Using multimedia as a support for effective learning is strongly agreed by 80% and agreed by 18% which shows that 98% acceptance by the students. Using SMS, email and world wide web are tools which helps students to learn from external resources and this research verifies that for world wide web 77% (34% strongly agree and 37% agree), for using SMS 74% (34% strongly agree and 40 % agree) and for email 95%

(89% strongly agree and 6% agree) students response is positive which shows their high level acceptance to use these tools for learning achievements.

Table 56: Role of ICT in teaching and learning process

S. No.	Statement	SA	A	NS	SDA	DA	Total
7	ICT supported teaching learning environment makes class more interesting	28	26	4	2	5	65
8	ICT supported teaching learning environment is enjoyable	53	8	2	1	1	65
9	ICT supported teaching learning environment provides diversity	19	32	8	2	4	65
10	Use of ICT supported lesson more easy	51	9	1	0	8	69
11	ICT supported teaching learning environment increases motivation of students	58	3	2	1	1	65

12	ICT supported teaching learning environment enhances learning outcomes	39	22	1	2	1	65

Table 56 shows that out of total 65 respondents, 28 strongly agreed and 26 respondents agreed that 'ICT supported teaching learning environment makes class more interesting'. The results show that 61 respondents supported that 'ICT supported teaching learning environment is enjoyable'. In total, 51 responded agreed that 'ICT supported teaching learning environment provides diversity'. However, 61 participants were in favour of "Use of ICT supported lesson more easy' while 62 B.Ed trainees were agreed that 'ICT supported teaching learning environment increases motivation of students'. In addition, 61 respondents out of 65 were agreed that 'ICT supported teaching learning environment enhances learning outcomes.
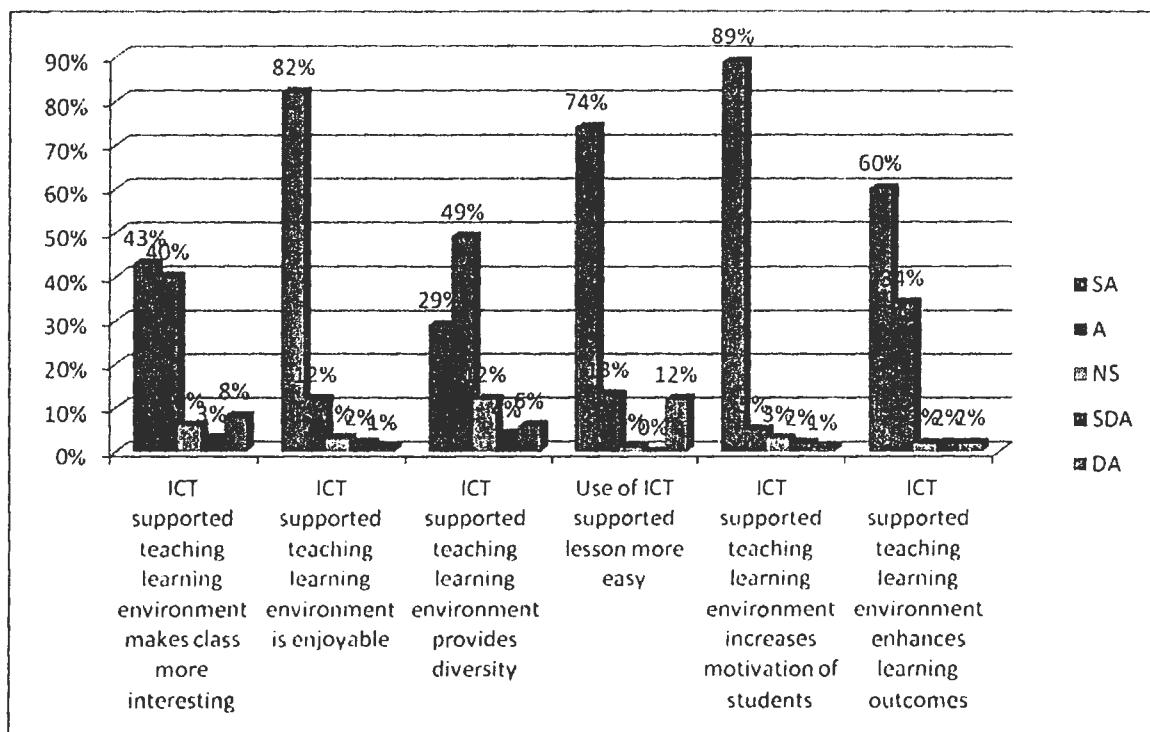
Figure 20: Responses of participants regarding role of ICT

The figure 20 shows that 43% and 40% B.Ed students strongly agree and agreed

respectively and highlighted that ICT supported teaching learning environment makes

class more interesting. The result shows that 82 % respondents confirmed that ICT

supported teaching learning environment is enjoyable. The 'ICT supported teaching

learning environment provides diversity' was strongly agreed by 29% and 49% students

respectively. However 87% respondents supported that use of ICT in lesson plans are

easy. The results also show that '84% students confirmed that 'ICT supported teaching

learning environment increases motivation of students'. However, 61% B.Ed trainees

confirmed that 'ICT supported teaching learning environment enhances learning

outcomes'.

Table 57: Participants' responses on traditional teaching method and use of ICT

S. No.	Statement	SA	A	NS	SDA	DA	Total
13	Lecture method teaching is enjoyable	4	5	1	42	13	**65**
14	Traditional teaching learning environment is very interesting	2	7	0	32	24	**65**
15	I am comfortable with traditional approach of teaching	6	9	1	41	8	**65**
16	ICT should be integrated in teaching	62	1	2	0	0	**65**

Table 57 shows that out of total 65 respondents 42 strongly disagreed and 13 respondents disagreed that 'Lecture method teaching is enjoyable'. In the response to 'traditional teaching learning environment is very interesting' 56 participants do not supported it. The results show that only 15 participants out of 65 were comfortable with traditional approach of teaching. However, in response to 'ICT should be integrated in teaching' 62 participants confirmed agreement.
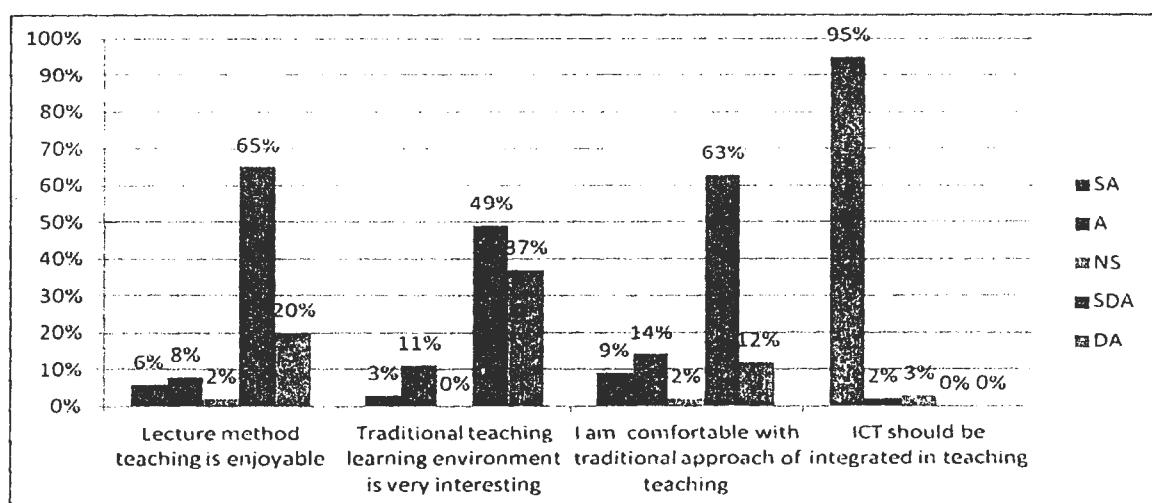
Figure 21: Responses on traditional teaching method and integration of ICT

The figure 21 shows that 65% B.Ed students confirm strongly disagreement that lecture method is not enjoyable while 20% supported showed disagreement regarding lecture method as an enjoyable. On the question of 'traditional teaching learning environment is very interesting', 49% B.Ed trainees showed strong disagreement with statement while 37% students showed disagreement and responded that traditional method do not provide interesting environment. About 63% students were found uncomfortable with traditional method whereas 9% and 14% students were found strongly agreed and agreed respectively. On the question regarding integration of ICT in teaching and learning process, 95% students showed strong agreement and responded that ICT should be integrated in teaching.

4.10. Qualitative Analysis

After the implementation of ICT-supported lesson plans, focus group interviews were conducted with teacher educators who delivered classes according to the model. All the participants of study appreciated and their response towards ICT was very positive. QSR NVIVO 10 was used for the qualitative analysis which helped to obtain the findings and results from the data collected through focus group interviews held with the teacher educators and B.Ed trainees who attended the classes. NVIVO software is a tool of analysis that supports in organizing and analyzing the contents and description from unstructured data with the help of coding.

The applications of model were tested in routine class courses focusing integration of ICT in teaching and learning process. Multimedia, power point presentation, word, excel, internet, email and SMS chat were used as tools for teaching and learning process. For the detail analysis of qualitative data collected through focus group interviews with the teacher educators and B.Ed trainees, using NVIIVO, main themes and sub-categories were formed. The point discussed during focus group interviews and opinion of teacher educators and B.Ed trainees were classified to obtain the in-depth information and feedback on the application of model with reference to ICT- supported teaching and learning process in pre-service teacher education program as given below in chart.

Table 58: NIVIVO Themes and subcategories for pilot testing of ICT model

#	Theme	Sub-Category
1	ICT-supported model teaching is interesting and enjoyable	a. Use of ICT and innovative teaching process
		b. Use of ICT improves productively
		c. Impact on teaching strategies
2	Use of ICT-supported model teaching enhances classroom activities	a. ICT offers opportunities to explore new knowledge
		b. Use of ICT supports process of learning by doing, more autonomy to students, flexibility and

			collaborative learning environment
			c. Use of ICT increases confident and satisfaction among students
3	Impact of ICT- supported model on teaching and learning process		a. Impact of using ICT on classroom teaching
			b. Impact of using ICT on learning achievements
4	Improvement to the ICT supported model		

The categories and subcategories are discuses below.

1. ICT supported model teaching is interesting and enjoyable

The participants of the study highlighted that teaching using ICT tools is very comfortable and easy for them. They expressed clearly that this model provided them opportunity to focus on the planned activities in specific direction.

a. Use of ICT and Innovative Teaching Process

All the participants agreed that ICT-supported teaching is interesting, but their view regarding 'enjoyable' was different. Their opinion reminded that they are not used to with

211

the method they have applied mentioning they have sometimes used only multimedia in conference room for presentation instead of regular classroom teaching practices. One teacher educators said

"It was amazing for me to be focused on topic. Normally, during lecture method ,we experience distraction from the topic has been common when students are asking questions not related with topic in classroom, but the way we prepared lesson plan on PowerPoint. The first slide shown was summary of a day's classroom mentioning what we will study in the topic and it related components. I must say it is really enjoyable".

The response of two teachers indicated that using ICT tools is very interesting, but command on the application of soft ware or tools are required. Their opinion supported the idea that using ICT tools and integration of ICT make teaching enjoyable. The opinion of the students was in favour of 'enjoyable'. They claimed it is very interesting for them to learn from the teacher and search other information using internet and websites as recommended by teacher. Students emphasized that they normally discussed subject with other class fellows, but using internet and SMC chat was very easy for them to communicate new information of links of website with other fellows. One student mentioned:

"We are keen to use ICT tools for our specific subject knowledge. Normally, we browse many websites for general information, but when we are guided by teachers, we focus our

browsing. We know that our study will make our future and it is good for us to concentrate on focused learning."

Adding comments, one student mentioned:

"It is very interesting for us when are informed not only in the class but through emails and SMS on topic for the next lecture. Every student tries to get the related knowledge from internet so that on that topic he must have initial knowledge for the best understanding for discussions and sharing with the classmates from different point of views."

One teacher educators highlighted that ICT-supported model is a very good idea, but there should be more flexibility for teacher in teaching process rather than sticking to PowerPoint presentation only. White board, marker and other conventional tools including verbal demonstration by students must be integral part of teaching methodology.

b. Use of ICT Improves Productivity

The responses of both the teacher educators and students indicated high productivity when teaching and learning is supported by ICT and different tools are used to enhance the teaching and learning process. Simultaneously, teacher educators and students showed reservations of accessibility of internet to all students and competency to use ICT. They highlighted there are so many students who do not have their own computers or laptops and even no access in the college which creates disappointment for those students who do not have access to ICT facilities. One teacher educator remarked:

213

"It is fact that ICT creates own learning, but it depends on the user how much he or she plays with the information available on websites. Our concern is access to the facilities. It is very easy for us to take the students on ICT- based learning, but we are unable to support those students who do not have access to ICT means."

The above argument was supported by most of the students and teacher educators. In contrast, the opinion of some students was different supporting the idea to enhance the productivity using ICT in teaching and learning process. One student said;

"So what, if some students have no accessibility, we are ready to support them. I think we can share the information through discussion or sharing photo copy of assignments with each other. I accept the truth that some students do not have access to ICT sources including computer and internet facility, but the excuse of 'non-accessibility' is not logical. Ideally, we all have laptops and internet accesses all the time, but we have to live within our means. I would like to add that we have talk time packages on mobiles so we can discuss on telephone."

All the participants of study indicated their support for integration of ICT in teaching and learning process which is the best tool to share the information. They also said that ICT made their communication easy, reliable, collaborative and creative. It was a measurable and valid learning method creating new knowledge and provided opportunity to improve the learning productivity.

c.   Impact on Teaching Strategies

Teacher educators indicated major shift in teaching strategies due to integration of ICT in classroom teaching. According to their point of view, ICT is specific field; therefore, particular skills are required to use the applications of ICT resources properly. On the question of application of model, they expressed their satisfaction, but complained about shortage of time and comprehensive training on model instead of one-day training. One teacher educator expressed his views and said:

"There is no change in methodology, but there is difference in method of delivery and use of modern technological tools instead of conventional audio-visual aids. I feel uncomfortable to use multimedia and computer not because I feel shy or am not capable to use it, but I am not so much skilled as I have to be. It does not mean that we want to avoid ICT in teaching, but I express my concerns on trainings and improvement of ICT skills."

Almost all the participants highlighted very positive impact on teaching strategies which support teachers in teaching. Teacher educators, identifying the external forces which are pushing them to use conventional teaching methodologies and their concern regarding use of ICT in teaching practices emphasized that systemic approach should be adopted by integrating ICT in curriculum besides the modeling so that teacher may prepare themselves according to the requirement of using ICT in teaching.

215

2. Use of ICT-supported Model Teaching & Classroom Activities

Teacher educators' response was very positive on ICT-supported teaching model, but a few concerns were shown on generalization of model. They expressed their concern that for each subject, model may define the specific way of delivery and ICT tools applications. According to their point of view, the requirement of social science subjects and natural science subjects is different therefore detailed activities should be planned on model. They agreed on the sources used in model, but their emphasis was on facilities and trainings to empower the teacher in ICT skills. Teacher educator of physics said:

"I have prepared my lesson plans on computer and during preparation I used many sources to make it more effective and efficient. I planned classroom activities according to facilities available in classroom. I think, in science subject, we have to go beyond the multimedia and internet. We have to prepare animation models on the concepts so that student could understand that concept. For example, on the concept of atom and its particles, there must be animated model in which students can see how electrons and protons are moving."

The analysis showed that teacher educators were very much interested to plan classroom activities according to the requirement of subject. According to participants, ICT provides opportunities to demonstrate the concepts through computer based demos or animated model whether it should in a science subject or in art subject.

a. ICT Offers Opportunities to Explore New Knowledge

All the participants of the study confirmed that use of ICT in teaching practices offers

many opportunities both for teacher and learner to explore new knowledge. "ICT is an

emerging phenomenon in the field of education and its contribution is countless", said

one teacher educator. Their opinion regarding using ICT and its advances was clear, but

on access, the point of view of participants was different. One group highlighted that

besides creating opportunities for knowledge creation, it is creating a great difference

between affluent and less privileged students. They clearly mentioned the demerits of

ICT in terms of accessibility. One participant remarked:

"I don't have access to digital libraries where I can access the educational sources.

Unfortunately, advancement of ICT has blocked the book publishing here in Pakistan. In

library, we have books which were published 10 to 15 years ago. Where do I go for

consultation? Which source could I use for further reading? This generation gap has

created gulf between haves and haves not which is increasing sense of deprivation among

the teachers and students. "

Participants from other group pointed out that they agreed on the lack of equal

accessibility, but within their means they could obtain knowledge from many sources

available on internet. They indicated deficiencies at institutional level instead of blaming

teachers or students. According to them, it is responsibility of government to provide

opportunities for knowledge creation in every institution. On teacher educator said:

217

"When you are telling us how to use the ICT tools in teaching methodologies according to the requirement of model, we are using it and we do not feel any problem in its implementation. This model is facilitating us to strengthen our teaching process and we expect more from students. Similarly, we can do the same if we have opportunities to use ICT in teaching and learning process"

The overall assessment of participants showed positive response towards creation of new knowledge with the integration.

b. Use of ICT Supports: Autonomy, Flexibility and Collaborative Learning

The participants of study after practical work on model openly commented on application of ICT in education as compared to previous part of the study. Most of the participants highlighted benefits of ICT when different tools were used in teaching and learning process. Difference of opinion was found in teacher educators and students on autonomy of students and flexibility. The teacher educators indicated that more autonomy to students was not valuable. If students are allowed to use any source of information downloaded from unauthenticated websites, it would create confusion among the students approach towards subject knowledge. Therefore, they suggested that limitation may be put by the teachers so that learner should concentrate on specific information. According to one teacher educator:

"I have observed that some collect irrelevant information from unreliable sources which create confusion regarding subject knowledge. I think teacher should recommend reliable websites and sources of information to keep students on track."

They suggested that these limitations should be put in the curriculum design. All the participants agreed that ICT supports process of learning by doing as well as promoting collaborative learning environment. On the flexibility, the opinion was divided among both the teacher educators and students. One group who was in favour of more 'flexibility' pointed out that flexibility provides learner opportunity to create new knowledge, interpret information and explore new dimensions and independence to learner for creation of new knowledge. The participants supporting more flexibility were found in favour of unlimited flexibility in the context of subject knowledge. On the other hand, opposing opinion indicated for limited flexibility for the concentration on specific subject knowledge. One student highlighted:

"When I am searching on Google, I find hundreds of articles and information on that subject knowledge with different interpretations according to their own context and I am confused about my target. I also believe that as the names of recommended books with name author(s) is written on the text book, name of websites and links should also be written besides those books."

The overall analysis showed very positive response on integration of ICT as supportive tool for 'learning by doing approach' and creating collaborative learning, but difference of opinion was found on 'autonomy to students' and 'flexibility'.

Use of ICT increases confidence and satisfaction among students. The result of analysis indicated that when teaching and learning is supported with ICT, students are satisfied and confidence of students increased. All the students who participated in this study

219

highlighted that when assignments were given by the teachers, they tried to get more and more information about subject knowledge using electronic sources of information which made them confident and more informed to satisfy the teachers. Teacher educators also confirmed this as a reason of satisfaction. On participants explaining the reason of satisfaction said:

"Teacher is always striving to satisfy the needs of student. That is why he uses different techniques to explain the concept. The teacher always gives examples form common happenings in society relating them with concept so that students could understand the subject knowledge what teacher wants to transfer to students, but ICT has made it very simple, readymade and easy for teacher. On the other hand, students try to get more subject knowledge from other electronic sources."

The study result shows that model approach is very effective way to convince the teacher educators for the integration of ICT in teacher education. The study found that students were very comfortable and keen to use ICT in teaching and learning process. In addition, this study found that use of ICT in teaching and learning process may be very effective tool of motivation for students.

3. Impact of ICT- Supported Model on Teaching and Learning Process

The study found very positive attitude of both teacher educators and students towards acceptability of model. Though, time constraint did not provide opportunity to the researcher to find out the applicability in comparative environment, this may be

220

considered as pilot testing, highlighting the strengths and weakness when practically implemented in the field.

a. Impact of using ICT on classroom teaching

The analysis results showed satisfaction of teacher educators regarding use of ICT in teaching and learning process. All the teacher educators verified that the modeling approach was the only way to shift the existing teaching methodology. The participants showed high level satisfaction using ICT tools which helped teacher to explain the concepts clearly. One of the teacher educators said:

"We are used to using lecture method. Some time we prepare lesson plan, but many times on the basis of our existing subject knowledge and confidence we directly go into classroom and start lecture, which is in fact one-way communication. We had left to study more. For last 8 years, I have been teaching physics and I am confident to deliver lecture without any preparation, but preparing lecture on PowerPoint presentation provided me opportunity to search more knowledge using electronic sources"

The analysis indicated significant impact on classroom teaching. According to participants, ICT makes classroom teaching very interesting, enjoyable, flexible and collaborative learning environment.

b. Impact of using ICT on learning achievements

As discussed above, most of the participants pointed out significant impact on learning achievements. According to the participants integration of ICT has impact on learning outcomes classes as given below.

221

i. UCT of ICT tools and electronic means create knowledge

ii. Self-learning enhances learning outcomes

iii. Focused and planned learning increases analytical skills of students

iv. Use of internet, discussions, SMC chat and collaborative work provide opportunity to think out of box phenomenon

v. The face-to-face learning is replaced by collaborative learning which increases learning achievements among students.

4.11. Suggestions to improve the ICT-Supported Model

The overall acceptability of model was found satisfactory, but some suggestions were proposed by both teacher educators and students. The summary of those recommendations are given below:

1. The Model should be incorporated in curriculum design and implemented across the board in all colleges of education.

2. Good practices of conventional teaching methods should be part of ICT-supported model.

3. Besides researches, experts' opinion may be explored and incorporated in any teaching methodology.

4. The ICT modeling must be comprehensive with proper guidelines and process of implementation.

5. Before the implementation of any model, teacher educators should be trained on pre-requisite skills

6. New and innovative developments in ICT and its applications in-service trainings should be continuous process.

7. All the colleges of education should be connected through video link supportive teaching.

CHAPTER FIVE

FINDINGS AND CONCLUSION

The purpose of study was to explore and investigate the capacities of Government Colleges of Education in terms of infrastructure and resources with reference to ICT-enabling environment, recognition and perception of teacher educators regarding use of ICT in teaching learning process and problems and challenges faced by the teachers and B.Ed trainees. In addition, this study examined the needs of B.Ed trainees and explored the issues faced by the head of institutions in terms of facilities and resources which create hindrances for the implementation of ICT in B.Ed program and other in-service training programs for teachers.

The focus of study was to obtain in-depth knowledge and understanding with regard to the integration of ICT in teacher education in government colleges of education in B.Ed program, examining the current use of ICT in teaching practices, perception of ICT with reference to role of ICT in teaching and learning process, the existing competencies and skills to integrate ICT in teaching, needs of B.Ed trainees and major problems and challenges for ICT-supported environment. This chapter covers review of objectives and research related to the findings of this study

5.1. Major findings

5.1.1. The existing ICT-supported teaching practices (Research question 1)

The result of study indicated that ICT is not properly used by the teacher educators in existing teaching practices not because of lack of competencies and skills, but major reason was found as non-availability of infrastructure and resources.

5.1.1.1. Use of Computers

The quantitative data showed that only 14% of the teacher educators were constant users of computer and 44% were the frequent users and 19% of the teacher occasionally used computer in their teaching practices. The results indicated that 25% of the teacher never used computer for the teaching purposes. From the focus group discussion and class room observation, the study examined that the available computers were not advanced computers. All the participants complained about outdated computers (P-II and P-III) in three colleges of education except PITE where high tech computers and fully established computer rooms were found. The results indicated a non-satisfactory use of computers in teaching and learning process.

5.1.1.2. Use of Internet

Internet is very important source which provides access to the educational resources i.e. e-books, journals, articles, magazines and other sources of information used by the teacher educators to gain knowledge. The statistical data shows that only 35% teacher

225

educators responded that internet was accessible to the teachers and students. As the internet accessibility was itself intermittent, hence 50% of those respondents, who shared the accessibility of it, used the facility occasionally. The results of FDGs and interviews indicated very little usage of internet facility due to accessibility and power breakdown during college time.

5.1.1.3. Usage of computer in library

The result indicated that due to non-satisfactory availability of computers in library, only 20% teacher educators who agreed that there was computer section in library were the constant users. However, the result of FDGs and interviews indicated a little usage of library in all colleges of education except PITE where teacher educators used computer frequently in the library.

5.1.1.4. Use Multimedia in Classroom

Multimedia is supposed to be an essential tool for delivery of planned lessons in classroom. The result quantified that multimedia in classroom was used only by 47% teachers who had access to it. However, generally quantitative result showed only 18% teacher educators used multimedia subject to availability. The result of FDGs and interviews indicated lesser use of multimedia in classroom practice while classroom observation proved that multimedia was not properly used by the teacher educators in the classroom practice due to non-availability of multimedia in every classroom at all the time.

5.1.1.5. Use Multimedia in seminar room

The accessibility of the only multimedia was found mostly in seminar room. In all the colleges of education, only one multimedia was found for all teacher educators. The multimedia in the seminar rooms were utilized by 38% of the teachers who were frequent and occasional users. Almost all the teacher educators indicated that multimedia was not mostly used for presentation in the classroom due to one multimedia for each college. However, in PITE, frequent use of multimedia was found for delivery of lesson plan.

5.1.1.6. Use of Printers, Scanners and Digital Camera

Overhead projectors, printers, scanners and digital camera are some of the supportive ICT tools that are used for the teaching and learning process. The results indicated very nominal usage of these tools. The statistical result shows usage of these tools by 20%, 30%, 9% and 42% teacher educators respectively. The result of FDGs and interviews including classroom observation indicated very little utilization of those ICT tools for integration of ICT in teaching and learning process. It is worth mentioning that these tools were used mostly for seminars, meetings and briefing to high officials during visit.

5.1.2. Perception and Attitude of teacher educators about integration of ICTs (Research question 2)

The overall results indicated high recognition, favourable attitude and positive perception for the integration of ICT in teaching and learning process. The perception and willingness to use ICT in teacher education was very important for the integration of ICT

227

in teacher education program. The statistical results showed that teacher educators had positive perception in general towards the supportive environment for using ICT in teaching and learning. On the use of ICT in teaching and learning, the teacher educators had generally agreed on the impact of using ICT on teaching and learning. They highly recognized the importance of ICT and its impact in terms of learning achievements and its efficiency. They agreed that ICT tools had transformed the learning process and improved the quality of teaching with long term impact. With the introduction of ICT, the role of teacher has emerged as facilitator of learning. Similarly, the role of students has also evolved from just acceptance of whatever was delivered to active participant of learning experiences and sharing knowledge.

Both teacher educators' and B.Ed trainees' acceptance regarding importance of ICT provided sufficient ground to learn and implement ICT in teaching and learning. It was very encouraging that both of them (teachers and students) highlighted the importance of ICT in teaching practices. 46% respondents rated it as the 'most important' in teaching and learning followed by 'helpful' and 'effective' by 22% and 19% respondents respectively.

The results of FDGs and interviews verify the statistical results of positive perception, willingness of teacher educators to use ICT in teacher education and recognition of ICT as very important tool to face the challenges in 21st century.

The qualitative analysis shows overwhelming support for the integration of ICT in teacher education except a few teacher educators indicating negative perception of ICT mentioning some negative connotations such as (i) it makes mind lazy,(ii) library work is

228

reduced.(iii)intellectual work is decreased,(iv)students' performance is more mechanical and (v) handwriting skills are deteriorated.

The results provided significant evidence about the positive attitude and encouraging perception regarding the integration of ICT in B.Ed program by teacher education, head of institutions and B.Ed trainees. The overall results concluded through quantitative and qualitative analysis validate the significant results. Similarity, as found in the review of literature, perception and attitude of participants of this study towards the use of ICT in teaching and learning process for teacher education program was also found to be satisfying.

According to the findings obtained through FDG and interviews, the optimistic approach of participants was found due to following perceptiosn regarding ICT integration and its impact on teaching and learning.

- ICT brings certain changes in methodology and facilitates teacher educators as well as students.

- ICT assists teaching learning process.

- ICT helps the teacher in teaching and learning

- ICT plays a vital role to enhance the quality of education among the student teachers (B.Ed trainees).

- Students are more informative, knowledgeable by using ICT tools. They are ready to learn more by using technological means.

- ICT has made this world a global village in research and exchanging the views in cheaper way.

- ICT is very effective tool which makes teaching and learning enjoyable, easy and flexible.

- ICT is very important for new teaching methods used by the developed countries. It is the technology which can bring a change in our education system.

- Without using ICT in education, neither we can achieve our goals of education nor compete in world.

Most of the participants justified that integration of ICT in teaching enhances learning outcomes and due to its collaborative in-built character, learning experiences of the real world are increased

5.1.3. Capacities of Govt. colleges of Education in terms of ICTs delivery (Research question 3)

The successful integration and implementation of ICT in teaching and learning process depend on the availability and access to ICT tools to provide supportive environment for the implementation of ICT in classroom.

According to quantitative analysis, a large proportion of the teacher educators did not have access to the basic ICT tools. The result indicates the access to computer, which is fundamental tool for ICT integration, was available to only 23% teacher educators. However, only 35% teacher educators responded that internet was accessible to the teachers and students. On the other hand, only 20% teachers confirmed the availability of computer section in library and this proportion of teacher educators further reduced to 18%when they responded about the internet access in the library.

Accessibility of overhead projectors and multimedia in classroom were identified by 40% teachers. On the other hand, more than 70% teachers shared that multimedia was accessible in seminar room and not accessible for classroom teaching. More than 70% teacher educators confirmed that they had no accessibility to printer and scanner in their offices.

The results of FDGs and interviews indicated strong consensus among all participants regarding lack of infrastructure facilities which is real hindrance for the implementation of ICT in teacher education program. They mentioned that they did have such classroom settings which could facilitate ICT-enabling environment. In all colleges of education, only one multimedia was available and teacher educators was right to object how every teacher could be facilitated to use multimedia in classroom.

The results of quantitative and qualitative analysis are almost similar with reference to availability of infrastructure resources in the colleges of education. The results confirmed non-availability of (i) high tech computers, (ii) multimedia for every classroom, (iii) computer for teacher educators for their offices, (iv) access to internet, and lack of funds for repair and maintenance.

All the participants referring infrastructure issues indicated that the computers available in the college were very old (P-II & P-III) and they had to face technical problems. Therefore, computer laborites increased their fears and teacher educators felt uncomfortable during class. Lack of insufficient space in classrooms and unreliable equipments also interrupted their teaching process. Overall, lack of resources and

accessibility to ICT tools in the colleges of education was a great challenge which further made the learning process old fashioned.

5.1.4. Competencies of Teacher Educators (Research question 4)

The teachers had positive perception in general towards the supportive environment for using ICT in teaching and learning. Besides, 90% teachers knew basic computer operations and training need had emerged as almost 50% teachers did not agree that they got training to use ICT in teaching and learning.

The statistical results indicated adequate competencies in basic ICT skills. The findings show that almost 63% teacher educators had attended basic computer courses or diploma in computer. Almost 75%, 50% and 57% teachers perceived themselves that they could use internet resources, software, and prepare lesson plans on computer respectively. Teachers also identified themselves as confident users through agreeing on statements "I feel comfortable by using ICT in teaching (73%), I have confidence to integrate ICT in my teaching (76%) and I feel skilled and confident in using ICT tools (70%).

The qualitative analysis indicated confidence level of the teacher educators in using ICT in teaching and learning process. In spite of that, variety of level of competencies were found among the teacher educators, but they believed that it was easy for them to use ICT in teacher education program. Overall, the standard of teacher educators was found insufficient to integrate ICT in teaching and learning in their classroom practice. Similar opinion was made by head of institutions mentioning that teacher educators were competent to use ICT in teacher education program, but specific training would be

232

required for teacher educators to enhance their specific capacity with reference to integration of ICT in classroom practices. The result showed that adequate teacher educators were competent in basic computer skill, but lack confidence for specific skills that are required for teaching and learning.

Overall variance was noted in the existing competencies of teacher educators regarding use of ICT in teaching learning process. The opinion of some teachers indicated optimistic views that they were competent to use ICT tools, but facilities and recourses were a real constraint in usage of ICT.

5.1.5. Factors influencing ICT in Teaching Process (Research question 5)

The importance of ICT was highlighted by the teacher educators, B.Ed trainees and head of institutions. The results of quantitative analysis showed that the acceptance level for the importance of ICT was very high. Both the teacher educators and B.Ed trainees highlighted that ICT provides effective and efficient tools for teaching methodology reshaping the instruction in a very competent and communicative manner influencing learning achievements of students. The result indicated that 46% respondents rated integration of ICT as a 'most important' factor followed by 22% and 19% as 'helpful' and 'effective' respectively. The overall result shows that integration of ICT is considered as a valuable and effective source for the achievement of goal of education, particularly in accordance with the requirement of 21st century. In addition, the results of quantitative analysis highlighted following important factors which increase the importance of ICT in teaching and learning process.

- The participants generally agreed on the impact of using ICT on teaching and learning.

- They highly recognized the importance of impact of integration of ICT in terms of learning opportunities and its efficiency.

- The participants appreciated that ICT tools had transformed the learning process and improved the quality of teaching with output of lifelong learning.

The results of qualitative analysis indicated high level acceptance by teacher educators and head of institutions mentioning that in 21st century, ICT is the most important factor which is very indispensible for the sustainable development. Therefore, the role of ICT in education cannot be neglected. It is worth mentioning to quote one participant who remarked "If anyone thinks that he could survive without using ICT in 21st century, people will call him a fool". This shows that teacher educators have considered ICT as an integral part of teaching methodology highlighting "the time has gone when an individual was completing the task of teaching according to his own point of view. Now ICT has opened the millions of doors for new information covering different angles on same subject. Therefore, it is the requirement of time". Similarly, the remarks of heads of institution were also worth mentioning on the importance of ICT which have influenced teachers to use ICT as an important tool to improve the teaching methodologies accepting the factor emphasizing "The advancement of technology during last two decades has reshaped the world. I would say, due to ICT, the world is not a global village, but it is now a global room". Therefore, teacher has no choice to discard integration of ICT in classroom practices. The overall results of qualitative analysis were found very

supportive in favour of integration of ICT in teacher education due to following important factors:

- Integration of ICT has changed the role of teacher and instructional methodologies. Therefore, there is no choice to discard ICT from education process.

- The advancement of technology and its frequent usage in society and education has reshaped the mode and method of instruction.

- Teaching without integration of ICT is an outdated methodology with limited learning achievement and transferring fixed information.

- It is the technology which can bring a change in our education system.

Though the argument against the views also highlighted that some issues i.e. decline in book reading habit, the teaching method is machine-made and readymade tool instead of intellectual work. Learner's creativity is damaged. These opinions in the context of a few respondents could not justify the logic because technology provides more opportunities to find out many electronic resources and ways to solve the problems of student. Digitalization has opened the doors of information for the students to create their own knowledge for the solution of problems.

5.1.6. ICT and Future Perspective in Teaching (Research question 6).

The future of ICT is seen very bright in education according to the opinion of participants. The results obtained from statistical data indicated three major factors found

235

in this study included advantages of using ICT in classroom practices, teacher educators' strength to use ICT tools and demand of ICT in 21st century. This perception of teacher educators provides clear picture how teacher educators find ICT in classroom teaching. The statistical results highlighted that students' interest would be increased when ICT was integrated in instruction. Teacher educators rated that with the integration of ICT 60% interest among the students would be increased followed by 17% and 12% as very effective way of communication and easy access to obtain knowledge by the students respectively.

The result indicated very interesting picture in which ICT is considered as strength and a major source of teaching and learning process. More than 50% teacher educators identified ICT as a source to acquire subject knowledge. They rated ICT as their key strength to teaching. Nearly 20% identified that integration of ICT in teacher education made them confident to learn advanced skills and develop interest in subject area and the applications as well. The participants highlighted that with the induction of ICT, the role of teacher has emerged as facilitator, mediator and trainer. The participants emphasized the need to implement new teaching methodology supported by ICT because of the changed role of teacher educators.

Similarly, teacher educators accepted that the role of student has also evolved from just acceptance of whatever was delivered to active participant of learning experiences, sharing knowledge and creation of new knowledge to solve the problems. Therefore, it is

the need of hour to adopt new methodologies in instructional process supported by the applications of ICT.

On the other hand, qualitative analysis supported the results of quantitative analysis. "Collaboration is a 21st Century skill of increasing importance and one that is used throughout the learning process" (Churches, 2009, p.8). The results of this study highlighted that effectiveness of ICT as a source of communication agreeing that the advancement of ICT and its frequent use in society has left no option to continue the old teaching methodology to achieve the goals of education. However, contradiction was found on the level of integration, keeping in view the education philosophy of learning by doing and enhancement of intellectual skills of students. Most of participants accepted ICT as a very efficient and effective way of teaching with very positive attributes enhancing the learning achievements.

The way how teacher educators will take ICT in teacher learning process is reflected from comments of participant mentioning "The integration of ICT in teaching and learning is very important. For example: if we are studying the Moen-Jo-Daro topic in Pakistan studies subject, so through using ICT tools such as videos and films, we can run the program of Moen Jo Daro which means we brought Moen-jo-Daro before students. This way of learning will always be remembered by students."

The example has been given from the subject of social science, Pakistan studies. The results indicates that teacher feels that applying lecture method, they cannot properly present the clear picture of Moen-Jo Daro, the old civilization of Indus valley which was

237

highly advanced. Moen-Jo- Daro, 5000 years old archeological site is located in district Larkana, Northern part of Sindh, the second largest province in Pakistan. It was a big planned oldest city ever found in the world. This shows that teacher educators see concept of simulation and games very effective way in teaching and learning process defining and explaining the conceptual understanding through films and games. According to another participant "If we are watching movie on Moen-Jo-Daro, we will remember it for life, but if it is explained through a lecture in a classroom, we cannot remember it for a long time. Therefore, ICT provides us an opportunity to learn comfortably by using different tools and techniques which enhance the learning. Not only this, but by using ICT, we can exactly achieve what has been said in Bloom's taxonomy."

In addition, the results reflected both theoretical and practical understanding regarding use of ICT, its effectiveness and contribution to enhance learning outcomes. The participants' keenness to learn more and keep them involved more and more in new instructional designs for the improvement of education system manifested how they see integration of ICT in future.

5.1.7. A Way Forward to Use ICT in teaching (Research question 7)

The overall results according to the participants' point of view and analysis of both quantitative and qualitative data regarding ICT, its importance in teacher education; usage of ICT in teaching and learning process was compiled. It will not be exaggerated to say that participants were very informative, enthusiastic to learn more about ICT, keen to find more opportunities to use ICTs in teacher education program offered by government

colleges of education. The participants positive perception towards integration of ICT shows that for them ICT can:

1. enhance and improve quality teaching;

2. be very effective and efficient tool of communication;

3. be helpful for both teacher educators and B.Ed trainees;

4. fulfill the needs and requirement of 21st century;

5. accomplish the educational goals and social needs;

6. improve quality of education and enhance learning outcomes;

7. provide opportunity to create new knowledge ;

8. provide problem-solving skills;

9. provide opportunity for flexible and cooperative learning

10. be very smart source of explanatory and advanced knowledge

11. provide opportunity to search more knowledge

12. provide qualitative and competitive environment

13. give easy, accessible and cheap source to obtain more knowledge

14. available at any time at any place through internet

The above perceptions of participants indicate a way forward for integration of ICT in teacher education program. The statistical results of exiting competencies and usage of ICT in spite of that facilities and resources are not available in accordance with the requirement.

According to statistical data, teachers' attitude and perception, towards use of ICT impacting their teaching process, it clearly highlighted that 35% teacher educators

occasionally used different software while only 8% of them were confident to explain computer operations through various software. Further, it was explored that almost 38% of them had very little knowledge about the use of ICT-based applications, 22% were the occasional users while only 8% emerged as confident to use ICT-based applications.

The study found that 27% teacher educators were the occasional users of ICT tools and almost 30% of the teacher educators were not aware of ICT-based instructional methods. It was encouraging that teachers perceive themselves as regular (30%) and occasional (32%) identifier of resources to keep them updated. However, it is also worth mentioning that 24% of them were unaware of different resources that can help them to update on ICT application in the field of education. It emerged as a fact that their willingness to learn and grow with new knowledge made teacher educators confident and ready to be innovative in their teaching and learning process.

The above facts and figure indicated very positive attitude to use ICT in teaching and learning process and see ICT very effective and efficient for the achievement of education goals, lifelong learning and problem solving skills. In contrast, analysis of qualitative data indicated that 60 to 70%, ICT tools like multimedia, PowerPoint presentation, overhead projector, and computer are used, but less usage was due to non-accessibility of tools and power breakdown.

The results of FDGs and interviews indicated positive perception and willingness to use ICT in classroom teaching. Difference of opinion was noted in training needs. One group of participants was in favour of specific trainings and others group considered it as a part of in-service training. After evaluating the data collected through FDGs and interviews,

240

willingness was shown by all participants, pointing out benefits of ICT subject availability of resources enabling ICT-supportive environment for the integration of ICT.

- Technology must be integrated in teaching, but the policy should be across the board.
- Before the integration of ICT, all facilities and resources should be provided for both the teachers and students and teachers may be trained on new teaching methodologies
- Way forward is to provide support by the government and other agencies to improve the infrastructure and facilities
- Provide physical infrastructure, facilities and resources in hard and soft copies as a fundamental requirement of ICT teaching.
- There should be proper model for teaching
- Full-time standby generator should be provided so that the work may not be terminated during the class.
- At least 08 classrooms must be digitalized with all facilities for both teachers and students.
- Full support by government and administration must be ensured
- There must be more seminars for awareness
- There should be continual training plan on ICT integration with proper follow up of trainings.

- Comprehensive training of teachers on usage of tools and teaching methodologies should be the top priority of administration

5.1.8. Need Analysis in terms of requirement of B.Ed Trainees (Research question 8)

The result showed that B.Ed trainees' attitude toward the ICT tools appear from their frequency of usage in different manners. Almost 68% students agreed while 19% of them denied using computer at their home. On the other hand, when the matter comes up on the preparation of assignments on computer, 59% students shared that they do utilize computers while working on their assignments. 14% students responded as unsure in form that sometime they do and sometimes do not. It is encouraging that students were aware of the role of ICT in their learning process, 76% perceives that it is very supportive for them to acquire knowledge. About 70% of the students mentioned that students do show their interest towards the usage of ICT in teaching methodology and welcome new ideas and technology for better learning.

A good proportion of students had basic computing skills. They were confident and regular users of computer. Almost 60% were found confident to run the programs in computer and organize files in different folders. About 53% B.Ed trainees were found capable of searching the files (53%) and 50% from them indicated their competency to copy the files from one folder to another. Almost 40% B.Ed trainees were found confident and regular users of creating back up files in various medium, however 30% were not aware of these skills as well. Almost 50% B.Ed trainees had skills to take print

242

of files and also had ability to use digital camera while at the same time, 30% students emerged as unaware of the skills of taking prints of files using computer with 10% unaware of using digital camera. Comparatively, scanners are used by almost 40% students with 25% students who do not have skills to use it.

The overall results shows the deficiencies in different computer skills which can be easily rectified through short courses to be offered by the institution.

5.2. Discussions and conclusions

This study revealed key finding on perceptions of ICT, integration of ICT in teacher education, impact of ICT on teaching and learning and problems and challenges to implement ICT in their classroom teaching. In addition, the study also explored the issues and barriers which create hindrance in using ICT in teacher education program. The research study has proposed ICT-supported teacher training model, whereas Pelgrum & Law (2003) point out that there is need to establish model covering infrastructure, teaching methodology and learning outcomes. According to summary of some key findings, the research study investigated to answer the question about the perceptions of head teachers, teacher educators and B.Ed trainees. The results of quantitative and qualitative analysis showed positive perceptions by overwhelming majority of the participants to use ICT in teacher education. The perceptions were driveled from the participants' attitude towards use of ICT in teaching and learning process and their acceptability for ICT as effective and efficient tool to achieve the goals of education. The study identified that respondents considers ICT as time saving and knowledge-enriched tool supporting teaching and learning process more effectively and efficiently

243

which are key influencing factors for participants of study to use ICT in teacher education program. However, the results explored that teacher educators require more training on new ICT integrated pedagogical approaches for the improvement and enhance their ICT skills. The result also investigated pedagogical ICT skills and competency deficiencies among teacher educators; therefore, teacher educators recognized training as barrier in implementation of ICT in instruction. Fluck (2008) also emphasis on the model and he states that there are many benefits of model which may define a full range of information and skills required for ICT so that changes in teaching methodology may be structured.

The result of this study found lack of infrastructure, facilities and resources for ICT-supported environment as a major hurdle for the implementation of ICT in teaching practices. The research caaried out on ICTs in learning: Problems faced by Pakistan by Taimur-ul-Hassan, Abdur Rahim Sajid indicates that;

> Shortage of skilled staff, ineffective examination system, bad internet connections, unproductive curriculum, excessive failures of electricity, lack of motivation, confidence and competence by the teachers and staff, time shortage, English language, lack of training, fear of technology, illiterate family background of teachers and learners, etc.(Hassan & Sajid, 2013, p.61)

This research explored teacher educators considers ICT very important tool in teaching and learning process but competency deficiencies and usage of ICT are major hurdles in implementation of ICT.

Teacher training institutions has to develop strategic plans to improve teaching and learning process so that all prospective teachers will be well trained o use the new tools in teaching methodology (UNESCO, 2002). This study also found that teacher educators were the occasional users of ICT tools and were less aware of ICT-based instructional methods. Therefore ICT may be integrated in teacher education programs.

5.3. Contribution of Research

This research study investigated the level of integration of ICT in teacher education program including problems and challenges encountered to implement new ICT-integrated instructions in government colleges of education. The study explored that traditional methodology is used in teaching learning process for the preparation of prospective teachers for primary school education. In addition, the important contribution of research is development of ICT supported model for teacher trainings. The proposed model provides a framework regarding use of ICT in teaching and learning process to achieve educational objectives

The research study highlighted the major issues and challenges which are real hindrance in adopting ICT-integrated teaching methodology. In addition, this study investigated the perceptions of head of institutions, teacher educators and students regarding use of ICT in teaching learning process, its impact on learning outcomes and their willingness to use ICT in teacher education program. The results of study indicate positive perceptions with regard to integration of ICT in teacher education and overwhelming majority of

respondents showed willingness towards integration of ICT and participants of research were keen to adopt new way of teaching using ICT tools.

The study found valuable information about the major barriers, competency deficiencies of teacher educators and training needs for teacher educators. On the basis of findings of research, ICT-supported model of teacher education program was developed which will provide understanding and new experience for the integration of ICT in teacher education program and pave the way for new initiatives and policies by ministry of education for the promotion of pedagogical changes to face the challenges in 21st century.

5.4. Recommendations

On the basis of above discussions and findings, recommendations are made based on the findings and discussions. The following recommendations are presented for policy makers, administrators, teacher educators and B.Ed trainees.

5.4.1. Recommendations for Policy Makers

The advancement of technology and emergence of new teaching methodologies is the only way to face the challenges of 21st century. Therefore, according to the national ICT standards, ICT may be integrated in teacher education programs. The existing pre-service teacher education policy may be reviewed in terms of in-service courses on integration of ICT in teaching and learning process to enhance the ICT skills of teacher educators. This research study found lack of infrastructure, facilities and resource for ICT-enabling environment as a major obstacle for the implementation of new ICT-supported teaching

246

methodologies. This research suggests following key policy reforms to create competitive environment for prospective teachers:

1. Establishment of at least 04 digital classrooms in every college of education;

2. Establishment of one fully equipped digital library in every college of education with access to important digital libraries in the world.

3. Establishment of one video conference hall fully equipped with all required digital facilities;

4. Provision of high tech computers, laptops, electronic equipments, UPSs, multimedia resources, software and full time internet facility for each classroom and library accessible to teachers and students

5. Full time standby generator to cope with the power breakdown.

6. Arrangement of bi-annual 15-day refresher courses for teacher educators

7. The curriculum of teacher education should be revised in accordance with needs and requirements with in-built ICT supported teaching methodology.

8. Reforms should be made in evaluation and assessment system according to the international standards.

5.4.2. Recommendations for Administrators (head of institutions)

The results of study showed very limited and insufficient infrastructural facilities and resources for integration of ICT. The efforts may be taken to purchase new and upgraded hardware and software from the college budget slowly and gradually to improve ICT enabling environment. Full-time internet facility and generator may be provided to the existing facilities and computer rooms may be accessible beyond the college hours to the

students. This research suggests following improvement to encourage ICT-supported environment for both teacher educators and B.Ed trainees:

1. The existing resources may be fully utilized at maximum level

2. Teacher educators may be encouraged to use ICT tools in classroom teaching as much as possible for them;

3. Traditional classroom practices may be discouraged

4. ICT subject may be offered in computer room

5. B.Ed trainees may be assigned the tasks of collaborative work and advised to share their work with other class fellows through emails.

6. Proper ICT-supported lesson planning may be encouraged

5.4.3. Recommendations for Teacher Educators

Teacher educators are the role models for B.Ed trainees. These prospective teachers will follow the teacher educators' teaching methodologies applied in classroom practices. The skills demonstrated by teacher educators may encourage prospective teachers to follow new skills for creation of new knowledge to improve their teaching skills with the integration of ICT in teaching and learning process. The study results showed very positive perception by teacher educators for implementation of ICT in teacher education program. For the teacher educators, following suggestions have been offered:

1. Students may be encouraged to prepare the assignment using electronic sources

248

2. Teacher educators, particularly in science subjects, may use different software to solve the problem

3. Project-based techniques, evaluation methods, and computer based assessment may be used by teacher educators so that B.Ed trainees learn integration of ICT in classroom practices.

5.5. Suggestions for Further research

- The future research is recommended for more observational and experimental studies to explore other context, trends and barriers in implementation of ICT in teaching and learning process in government elementary colleges of education offering in-service training programs under new design of study (2 years Associate Diploma and 4 years B.Ed program) in Sindh.

- Comparative studies between current one year B.Ed program and 2 years Associate Diploma and 4 years B.Ed (Honours) program are also proposed to explore the strengths and weakness with reference to integration of ICT.

- Furthermore, qualitative research studies be conducted to investigate the applicability and effectiveness of proposed model developed in this dissertation. With reference to this study, similar studies might be conducted to compare the impact in the subjects of natural sciences and social sciences along with investigation to explore the attitude and perceptions of science teachers and teachers of social sciences.

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APPENDIX A

QUESTIONNAIRE FOR TEACHER EDUCATORS

The aim of this questionnaire is to assess the use of ICTs in elementary colleges of education as additional means in teaching and learning process promoting supportive learning environment for teacher educators. The information collected will be kept confidential.

In most of the questions there are five choices and you are requested to tick mark the box that indicates the best response in your opinion and some questions are open ended indicating views regarding use of ICTs.

Section 1: Introductory information

1. Name:_____
2. Gender : ☐ Male ☐ Female
3. Academic Qualification _____
4. Professional Qualification_____
5. Experience: less than 3 Years ☐ 3-5 years ☐ 6-10 years ☐ 11-15 years ☐
   16-20 ☐ years ☐ 21-25 years ☐ 26- 30 years ☐
6. Name of institution: _____
7. Subject taught:_____
8. Have you attended any computer course:
   a. Diploma in computer
   b. Diploma in ICT
   c. Short Course in Basic computer
   d. Other _____

Section 2: Access to ICT tools

S. No.	Statement	Y=Yes	N=No
1.	Computer for each teacher in office		
2.	Full time internet access to teachers		
3.	Well established IT labs for student		
4.	Full time internet access to students		
5.	Computer section in library		

275

6.	Full time internet access in library for teachers and students		
7.	Multimedia in classroom		
8.	Seminar room		
9.	Multimedia in seminar room		
10.	Overhead projector in classroom		
11.	Printer in teachers office		
12.	Scanner		
13.	Digital Camera		

Section 3: Use of ICTs tools in teaching

C   Constantly

F   Frequently

O   Occasionally

R   Rarely

N   Never

S. No.	Statement	C	F	O	R	N
1.	Computer					
2.	Internet					
3.	IT labs					
4.	Computers in library					
5.	Multimedia in classroom					
6.	Seminar room					
7.	Multimedia in seminar room					
8.	Overhead projector in classroom					
9.	Printer					
10.	Scanner					

11.	Digital Camera					

Section 4: Supportive environment and attitude towards use of ICTs as tools in teaching-learning process

SA   Strongly Agree

A   Agree

SDA   Strongly Disagree

DA   Disagree

NS   Not Sure

S. No.	Statement	SA	A	SDA	DA	NS
1.	Teachers are regularly trained in use of ICTs in teaching					
2.	Teachers have facilities to ICTs resources at any time					
3.	I know basic computer operations					
4.	I use application software					
5.	I use Internet Resources					
6.	I feel comfortable by ICTs in teaching					
7.	I feel very confident to evaluate computer for teaching and learning					
8.	I have the confidence to integrate ICT in my teaching					
9.	I am skilled and confident in using ICTs in teaching – learning process					
10.	I prepare lesson plans on computer					
11.	I have 1.personal computer2. Laptop, 3, desktop (three options may be used in question)					
12.	I have internet access at my home					
13.	ICTs offer opportunity for improving the learning performance					
14.	The use of ICTs tools increase the efficiency of the learning process					
15.	Student motivation increase when ICTs are used as a learning tool					

16.	With the use of ICTs students with learning difficulties can get more benefit from the informative possibilities					
17.	Use of ICTs increases the level of creativity of students					
18.	Use of ICTs can facilitate the teacher to apply differentiation among the students					
19.	Using ICTs tools transforms teaching and learning process					
20.	ICTs have changed teaching methodologies					
21.	Use of ICTs in teaching involves the mechanism of instructional process in the classroom situations					
22.	Use of ICTs provide level of teaching					
23.	Use of ICTs in teaching involves theories of teaching					
24.	ICTs in education offers possibilities in lifelong learning					
25.	ICTs in education offers possibilities in e-learning					
26.	To achieve educational objectives ICTs provide understanding of the potential of technologies					
27.	ICTs have changed the role of teacher					
28.	Using ICTs in education changes the way of operation and skills of teacher					
29.	In the age of ICTs, role of teacher is to provide services to the learner and he is now monitor and mentor					
30.	Integration of ICTs in education has changed the role of teacher as facilitator					
31.	Using ICTs, teacher becomes coordinator of learning experiences and students become more active participants in the learning process					
32.	Students learn more when ICT is used as mode of teaching					
33.	Integration of ICTs in teaching enable students to learn in their own way and make choices based on their own perceptions according to their needs					
34.	Integration of ICTs enable students make					

S. No.	Statement				
	choices based on their own perceptions according to their needs				
35.	Use of various kinds of ICTs tools provide rich learning experience to students				

Section 5: Competencies in the use of ICTs as tools in teaching-learning process

CAE   Confident and Explain

RU   Regular User

OU   Occasional Usage

LK   Little Knowledge

NA   Not Aware

S. No.	Statement	CAE	RU	OU	LK	NA
1.	I routinely use computer operations using different softwares					
2.	I use ICTs based applications					
3.	I apply modern ICTs based instructional methods and appropriate tools					
4.	I demonstrate advanced knowledge using technological tools for solving problems and presentations					
5.	I design and develop technology integrated student learning activities using variety strategies					
6.	I choose , assess and integrate tools of ICTs in instruction in the subject area					
7.	I demonstrate my knowledge using ICTs based tools to support instruction					
8.	I demonstrate skills in using word processing and applications					
9.	I demonstrate skills in using PowerPoint and applications					
10.	I demonstrate skills in using spreadsheet, data management and					

		applications					
11.	I demonstrate skills in using print and graphic applications						
12.	I identify resources to keep update in ICTs in education						
13.	I keep myself updated and enhance personal and professional efficiency						
14.	I apply ICTs to facilitate emerging role of educator						
15.	What are three major advantages of integration of ICTs in teaching and learning process						
16.	What are your key strengths in use of ICTs?						
17.	What are your weaknesses in use of ICTs?						
18.	What importance do you place on ICT in the teaching?						
19.	Is teaching with computers and other technologies better than teaching without them?	Yes ☐ No ☐ If yes please give details:					
20.	Please state, in order, the three most major hurdles you found to using ICTs	1.. 2.. 3..					
21.	Please state, in order, the three most supportive factors you experienced to using ICT:	1.. 2.. 3..					

APPENDIX B

QUESTIONNAIRE FOR B.ED TRAINEES

The aim of this questionnaire is to assess the use of ICTs in elementary colleges of education as additional means in teaching and learning process promoting supportive learning environment for teacher educators. The information collected will be kept confidential.

In most of the questions, there are five choices and you are requested to tick mark the box that indicates the best response in your opinion and some questions are open ended indicating views regarding use of ICTs.

Section 1: Introductory information

1. Name of student_____

2. Class _____section_____

3. Gender :　　　☐　Male　☐　Female

4. Name of institution: _____

5. Studying since?　　　One year　☐ two years ,　☐

6. Have you attended any computer course:

    a. Diploma in computer　　　　☐

    b. Diploma in ICT　　　　　　☐

    c. Short Course in Basic computer　☐

    d. Other _____

Section 2: Access to ICT tools

S. No.	Statement	Y=Yes	N=No
1.	Computer for students		
2.	Well established IT labs for student		

3.	Full time internet access to students		
4.	Computer section in library		
5.	Full time internet access in library for teachers and students		
6.	Multimedia in classroom		
7.	Seminar room		
8.	Multimedia in seminar room		
9.	Overhead projector in classroom		
10.	Printer		
11.	Scanner		

Section 3: Use of ICTs tools in teaching- learning process

C   Constantly

F   Frequently

O   Occasionally

R   Rarely

N   Never

S. No.	Statement	C	F	O	R	N
1.	Computer					
2.	Internet					
3.	IT labs					
4.	Computers in library					
5.	Multimedia in classroom					
6.	Seminar room					
7.	Multimedia in seminar room					
8.	Overhead projector in classroom					

S. No.		SA	A	SDA	DA	NS
9.	Printer					
10.	Scanner					

Section 4: Supportive environment and attitude towards use of ICTs as tools in teaching-learning process

SA   Strongly Agree

A   Agree

SDA   Strongly Disagree

DA   Disagree

NS   Not Sure

S. No.	Statement	SA	A	SDA	DA	NS
1.	Teachers are well updated in use of ICTs in teaching					
2.	I regularly use computer at home					
3.	I have enough time to prepare assignments using ICTs					
4.	I prepare assignments on computer					
5.	I have facilities to ICTs resources at any time in the institution					
6.	Use of ICTs is very much supportive for students					
7.	Students show interest using ICT as teaching methodology					
8.	Student learn more when ICT is used as mode of teaching					
9.	Multimedia tools enhance comprehension and learning					
10.	I hear and I forgot, I see and I remember, I do and I understand					

Section 5: ICTs needs of B.Ed trainees

CAE Confident and Explain

RU Regular User

OU Occasional Usage

LK Little Knowledge

NA Not Aware

S. No.	Statement	CAE	RU	OU	LK	NA
	Basic Computer Skills					
11.	I can run programs in a computer system					
12.	I use CD Based softwares					
13.	I can organize files into a folder					
14.	I can search files in the computer system					
15.	I can copy files from CD to Computer					
16.	I can create backup files onto various media types (CD, DVD, USB, Hard Drive)					
17.	Printing a file					
18.	I can connect the various parts of the computer					
19.	I can use a scanner for copying images					
20.	I can use a Digital Camera to take photographs					
	Word Processing					
21.	Creating a new document file in Microsoft Word					
22.	Using simple Editing in MS-Word					

	e.g. bold, italics, etc.						
23.	Applying Spell check in MS-Word						
24.	Inserting an image in a word document						
25.	Using Header and Footers						
26.	Setting the margin of a page						
27.	Saving a document file in different format like HTML						
28.	Creating tables in a word document						
29.	Inserting page numbers to a word document						
30.	Adding a new column to an existing table in MS-Word						
	Spreadsheet						
31.	Inputting data in rows and columns of spreadsheet						
32.	Sorting the data in ascending or descending order						
33.	Adding few numbers of a column using formulae						
34.	Cell-referencing in a spreadsheet						
35.	Protecting a spreadsheet through password						
	power point presentation						
36.	Creating a basic presentation package						
37.	Adding clip arts within the slides						
38.	Modifying the colours of the text and lines						
39.	Introducing animation onto slides						
40.	Modifying transition between slides						

41.	Rearranging the slides within the presentation					
42.	Produce appropriate hand out formats					
43.	Using of LCD projector for presentations					
	Internet					
44.	Accessing the World Wide Web using web site address					
45.	Using search engines to find information					
46.	Downloading files from the internet					
47.	Saving text and images from web pages					
48.	Sending and receiving of e-mails					
49.	Attaching files to outgoing e-mails					
50.	Forwarding e-mails to selected contacts					

APPENDIX C

CONSENT FORM

RESEARCH TOPIC: A MODEL FOR INTEGRATION OF INFORMATION AND

COMMUNICATION TECHNOLOGIES (ICTs) IN

TEACHER TRAINING

NAME OF RESEARCHER: FAHEEM ABBASI

I .... Lecturer/............./...........................of

Government College of Education/ PITE... agree to

take part in this research

Researcher has clarified to me the purposes of the research.

Purposes of the research

This research study aims to provide an understanding and user knowledge regarding the use of ICTs by the teacher educators. This study will benefit teacher educators, head of institutions and policy makers to make the efficient use of ICTs in teaching learning methodologies for the training programs. This study will be supportive to provide a clear picture on competencies the teacher educators and use of ICTs in

teaching. The study will highlight pertinent issues regarding the use of ICTs by teacher educators and key aspect to ICTs integration in teaching. Moreover, this study will reveal a social influence of ICTs on teacher educators' preparation and how it relates and the need to carefully consider pedagogical decisions pertaining to ICTs use during the teaching. It is envisioned that better data collection and more research on issues related to the use ICTs would provide a stronger foundation for formulation of policy.

I have read this consent form carefully and I agree to participate in this study. I agree to the research results which will contribute in the education sector and my privacy is respected. I appreciate that my personal information will be kept confidential and the outcomes of this research will be used for research purpose. I agree to have interviews recorded on an audio recorder.

Signature:...................................

Date:......................................

APPENDIX D

QUESTIONNAIRE FOR B.ED TRAINEES (PILOT TESTING)

The aim of this questionnaire is to assess the use of ICTs in elementary colleges of education as additional means in teaching and learning process promoting supportive learning environment for teacher educators. The information collected will be kept confidential.

In most of the questions there are five choices and you are requested to tick mark the box that indicates the best response in your opinion indicating views regarding use of ICTs.

Section 1: Introductory information

1. Name of student_____

2. Class _____section_____

3. Gender :   ☐   Male   ☐   Female

4. Name of institution: _____

5. Studying since?   One year   ☐ wo years   ☐

Section 2: Using ICT in teaching and learning process

SA   Strongly Agree

A   Agree

NS   Not Sure

SDA   Strongly Disagree

DA   Disagree

S. No.	Statement	SA	A	NS	SDA	DA

1.	ICT supported instruction creates conducive learning environment.						
2.	The use of multimedia supports effective learning						
3.	World Wide Web is very effective additional flexible source of learning						
4.	Use of SMS Chat creates interactive and collaborative learning environment among learners and the teacher educator						
5.	Use of SMS Chat creates interactive and collaborative learning environment amongst learners						
6.	Use of email creates learning environment collaborative, interactive and a flexible for students						
7.	ICT supported teaching learning environment makes class more interesting						
8.	ICT supported teaching learning environment is enjoyable						
9.	ICT supported teaching learning environment provides diversity						
10.	Use of ICT supported lesson more easy						
11.	ICT supported teaching learning environment increases motivation of students						
12.	ICT supported teaching learning environment enhances learning outcomes						
13.	Lecture method teaching is enjoyable						
14.	Traditional teaching learning environment is very interesting						
15.	I am comfortable with traditional approach of teaching						
16.	ICT should be integrated in teaching						

APPENDIX E

CLASSROOM OBSERVATION FORM

Name of college_____

Name of teacher_____

Subject_____

Date _____

NOTE:

This classroom observation form was used by researcher to observer the classroom teaching to evaluate the integration ICT in existing teaching practices in government colleges of education in Sindh.

Features of classroom observation

1. Classroom settings and environment : availability of ICT tools and digitalization

2. Teaching method: lesson plan, activities and integration of ICT

3. Use of computer and ICT tools: use of ICT activities and tasks completed with the support of ICT tools

4. Use of instructional materials: websites and other audiovisual materials

1. **Classroom settings:**

   - Number of computers available in classroom

     _____

     _____

   - Number of computers used during class

     _____

     _____

   - Placement of computers (suitable/unsuitable)

     _____

     _____

   - Multimedia

     _____

     _____

   - Other ICT tools

     _____

     _____

   - Other comments (if any)

     _____

     _____

     _____

     _____

2. **Teaching method**

   - Lesson planning(PowerPoint presentation / hand outs)

- Lesson delivery using ICT tools

_____

_____

- Activities by B.Ed trainees

_____

_____

- Use of board and multimedia

_____

_____

- Using internet for further Reference and other ICT tools

_____

_____

- Other comments (if any)

_____

_____

3. **Use of computer and ICT tools**
   - Number of B.Ed trainees using computer/laptop in classroom

_____

_____

- Group work on computer

  _____

  _____

- Guidance by teacher educator

  _____

  _____

- Nature Activities carried out by B.Ed trainees using ICT tools and computers

  _____

  _____

- Tasks assigned to B.Ed trainees as an assignment

- _____

  _____

- Other comments (if any)

  _____

  _____

APPENDIX F

COLLEGES OF EDUCATION

Details of Colleges of Education					
Name of Institution	Staff				Class rooms
	Sanctioned		Available		
	TCH	NTCH	TCH	NTCH	
Government College of Education Federal B Area	40	22	32	17	9
Jamia Millia Government College of Education	22	14	7	8	6
Government College of Education	43	38	39	22	4

	Science Lab				Library	Librarian	Computer Lab	Computer Operator	Photocopies
	Chemistry	Physics	Bio	Science					
Government College of Education Federal B Area	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Nil	Nil
Jamia Millia Government College of Education	Nil	Nil	Nil	Yes	Yes	Nil	Yes	Nil	Yes
Government College of Education	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Nil	Nil

	Electricity	Telephone	Internet	Generator	Digital Camera	TV	DVD	Fax	Multimedia
Government College of Education Federal B Area	Yes	Yes	Nil	Nil	Nil	Yes	Nil	Nil	Yes
Jamia Millia Government College of Education	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

| | Yes | Yes | Yes | Nil | Yes | Yes | Nil | Yes | Yes |
| Government College of Education | | | | | | | | | |

	No of Trainings Rooms/Hall				Status of Rooms	Drinking Water	Admin Room	Science Lab	Computer Lab
	For 30 CPS	For 40 CPS	For 50 CPS	Total					
Government College of Education Federal B Area	0	40	0	40	0	Yes	1	4	Yes
Jamia Millia Government College of Education	1	0	4	5	0	Yes	2	2	Yes
Government College of Education	4	4	1	9	Satisfactory	Yes	1	1	Yes

APPENDIX G

UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS

Technology Literacy Approach		
Policy & Vision	The policy goal of this approach is to prepare learners, citizens, and a workforce that is capable of taking up new technologies so as to support social development and improve economic productivity. Related educational policies goals include increasing school enrollments, making quality resources available to all, and improving basic literacy skills, including technology literacy.	
	Curricular Goals	**Teacher Skills**
Policy	Policy Awareness. With this approach, programs make direct connections between policy and classroom practices.	Teachers must be aware of policies and be able to specify how classroom practices correspond to and support policy.
Curriculum and Assessment	Basic Knowledge. Changes in the curriculum entailed by this approach might include improving basic literacy skills through technology and adding the development of ICT skills into relevant contexts, which will involve time in the curricula of other subjects for the incorporation of a range of relevant ICT resources and productivity tools.	Teachers must have a firm knowledge of the curriculum standards for their subject, as well as knowledge of standard assessment procedures. In addition, teachers must be able to integrate the use of technology and technology standards for students into the curriculum.
Pedagogy	Integrate Technology. Changes in pedagogical practice involve the integration of various technologies, tools, and e-content as part of whole class, group, and individual student activities to support didactic instruction.	Teachers must know where, when (as well as when not), and how to use technology for classroom activities and presentations.
ICT	Basic Tools. The technologies involved in this approach include the	Teachers must know basic hardware and software

	use of computers along with productivity software; drill and practice, tutorial, and web content; and the use of networks for management purposes.	operations, as well as productivity applications software, a web browser, communications software, presentation software, and management applications.
Organization & Administration	Standard Classroom. Little change in social structure occurs in this approach other than, perhaps, the spatial placement and integration of technology resources in the classroom or in labs.	Teachers must be able to use technology with the whole class, small groups, and individual activities and assure equitable access.
Teacher Professional Development	Digital Literacy. The implications of this approach for teacher training focus on the development of digital literacy and the use of ICT for professional improvement.	Teachers must have the technological skill and knowledge of Web resources necessary to use technology to acquire additional subject matter and pedagogical knowledge in support of teachers' own professional development.

Knowledge Deepening Approach		
Policy & Vision	The policy goal of this approach is to increase the ability of the workforce to add value to society and the economy by applying the knowledge of school subjects to solve complex problems encountered in real world situations of work, society, and life.	
	Curricular Goals	**Teacher Skills**
Policy	Policy Understanding. This approach often involves teachers in understanding policies such that they can design lesson plans to specifically implement national policies and address high-priority problems.	Teachers must have a deep knowledge of national policies and social priorities, and be able to design, modify, and implement classroom practices that support these policies.
Curriculum and	Knowledge Application. This approach often requires changes in the curriculum that emphasize depth of understanding over coverage of content and assessments that emphasize the	Teachers must have a deep knowledge of their subject and the ability to apply it flexibly in a variety of situations. They must also be able to create complex problems as a measure of students'

298

Assessment	application of understanding to real-world problems and social priorities. Assessment change focuses on complex problem solving and embeds assessments into the ongoing activities of the class.	understanding.
Pedagogy	Complex Problem Solving. Classroom pedagogy associated with this approach includes collaborative problem- and project-based learning in which students explore a subject deeply and bring their knowledge to bear on complex, every-day questions, issues, and problems.	Teaching is student-centered in this approach and the teacher's role is to structure problem tasks, guide student understanding, and support student collaborative projects. In this role teachers must have the skills to help students create, implement, and monitor project plans and solutions.
ICT	Complex Tools. To understand key concepts, students employ open-ended technology tools that are specific to their subject area—such as visualizations in science, data analysis tools in mathematics, role play simulations in social studies.	Teachers must be aware of a variety of subject specific tools and applications and able to flexibly use these in a variety of problem-based and project based situations. Teachers should be able to use network resources to help students collaborate, access information, and communicate with external experts to analyze and solve their selected problems. Teachers should also be able to use ICT to create and monitor individual and group student project plans.
Organization & Administration	Collaborative Groups. Class periods and classroom structure are more dynamic, with students working in groups for extended periods of time.	Teachers must be able to create flexible classroom learning environments. Within these environments, teachers must be able to integrate student-centered activities and flexibly apply technology to support collaboration.
Teacher Professional Development	Manage and Guide. The implications of this approach for teacher professional development focus on the use of ICT to guide	Teachers must have the skills and knowledge to create and manage complex projects, collaborate with other teachers, and make use of

	students through complex problems and manage dynamic learning environments.	networks to access information, colleagues, and outside experts in supporting their own professional development.

Knowledge Creation Approach	

Policy & Vision	The policy goal of this approach is to increase productivity by creating students, citizens, and a workforce that is continually engaged in and benefits from knowledge creation and innovation.

	Curricular Goals	**Teacher Skills**
Policy	Policy Innovation. With this approach, teachers and school staff are active participants in the continuous evolution of education reform policy.	Teachers must understand the intentions of national policies and be able to contribute to the discussion of education reform policies and participate in the design, implementation, and revision of programs intended to implement these policies.
Curriculum and Assessment	21st Century Skills. With this approach the curriculum goes beyond a focus on knowledge of school subjects to explicitly include the 21st century skills such as problem solving, communication, collaboration, and critical thinking. Students will also need to be able to determine their own learning goals and plans. Assessment is itself a part of this process; students must be able to assess the quality of their own and each others' products.	Teachers must know about complex cognitive thought processes, know how students learn, and understand the difficulties students encounter. They must have the skills required to support these complex processes.
Pedagogy	Self Management. Students work in a learning community in which they are continuously engaged in creating knowledge products and building upon their own and each others' knowledge base and learning skills.	The role of teachers in this approach is to overtly model learning processes, structure situations in which students apply their cognitive skills, and assist students in their acquisition.
	Pervasive Technology. A variety of networked devices, digital	Teachers must be able to design ICT-based knowledge communities

ICT	resources, and electronic environments are used to create and support this community in its production of knowledge and anytime, anywhere collaborative learning.	and use ICT to support the development of students' knowledge creation skills and their continuous, reflective learning.
Organization & Administration	Learning Organizations. Schools are transformed into learning organizations in which all actors are involved in the learning process.	Teachers should be able to play a leadership role in training colleagues and in creating and implementing a vision of their school as a community based on innovation and continuous learning, enriched by ICT.
Teacher Professional Development	Teacher as Model Learner. From this perspective, teachers are themselves master learners and knowledge producers who are constantly engaged in educational experimentation and innovation to produce new knowledge about learning and teaching practice.	Teachers, too, must have the ability and inclination to experiment and continuously learn and use ICT to create professional knowledge communities.

Sources: UNESCO. (2011). *UNESCO ICT Competency Framework for Teachers.*
Paris: The United Nations Educational,Scientific and Cultural Organization.

APPENDIX H

Table of reliability and validity

RELIABILTY TESTING

TEACHERS QUESTIONAIRRE

All 43 items gives reliability of 0.872 alpha coefficient, which later reduces to 34 items which result into 0.934 alpha reliability

Reliability Statistics

Cronbach's Alpha	N of Items
.934	33

Some of the Item Correlations:

Item-Total Statistics

ITEMS	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
ICTs offer opportunity for improving the learning performance	0.655	0.93
The use of ICTs tools increase the efficiency of the learning process	0.756	0.929
Student motivation increase when ICTs are used as a learning tool	0.731	0.929
With the use of ICTs students with learning difficulties can get more benefit from the informative possibilities	0.734	0.929
Use of ICTs can facilitate the teacher to apply differentiation among the students	0.778	0.929
Using ICTs tools transform teaching and learning process	0.628	0.931
ICTs have changed teaching methodologies	0.672	0.93
ICTs in education offers possibilities in lifelong learning	0.682	0.93
To achieve educational objective ICTs provide understanding of the potential of technologies	0.806	0.93
Integration of ICTs in education has changed the role of teacher as facilitator	0.762	0.929
Using ICTs teacher becomes coordinator of learning experiences and students become more active participants in the learning process	0.746	0.929
Students learn more when ICT is used as mode of teaching	0.635	0.93

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I know basic computer operations	68.2903	329.146	.193	.934
I use application software	67.3871	311.978	.486	.932
I use Internet Resources	67.7097	319.413	.415	.933
I feel comfortable by ICTs in teaching	67.5161	316.858	.396	.933

I feel very confident to evaluate computer for teaching and learning	67.9677	325.032	.300	.934
I have the confidence to integrate ICT in my teaching	67.7742	321.247	.372	.933
I am skilled and confident in using ICTs in teaching – learning process	67.6452	322.970	.291	.934
I prepare lesson plans on computer	67.0000	314.867	.399	.934
I have Personal computer, laptop or desktop	67.8710	313.983	.488	.932
I have internet access at my home	67.6774	314.026	.481	.932
ICTs offer opportunity for improving the learning performance	68.1290	310.649	.655	.930
The use of ICTs tools increase the efficiency of the learning process	68.0323	306.232	.756	.929
Student motivation increase when ICTs are used as a learning tool	68.0968	310.157	.731	.929
With the use of ICTs students with learning difficulties can get more benefit from the informative possibilities	67.9032	310.290	.734	.929
Use of ICTs increase the level of creativity of students	67.8710	315.116	.489	.932
Use of ICTs can facilitate the teacher to apply differentiation among the students	67.7742	312.381	.778	.929
Using ICTs tools transform teaching and learning process	67.7742	312.847	.628	.931
ICTs have changed teaching methodologies	67.7419	310.265	.672	.930

Use of ICTs in teaching involves the mechanism of instructional ~~~ ss in the classroo~ situations	67.5806	313.852	.557	.931
Us~ ICTs provide level of ~aching	67.6129	318.845	.589	.931
Use of ICTs in teaching involves theories of teaching	67.4194	312.718	.597	.931
ICTs in education offers possibilities in lifelong learning	67.6129	310.578	.682	.930
ICTs in education offers possibilities in e-learning	67.6774	311.026	.543	.931
To achieve educational objective ICTs provide understanding of the potential of technologies	67.8710	316.183	.806	.930
ICTs have changed the role of teacher	67.6774	316.426	.479	.932
Using ICTs in education change the way of operation and skills of teacher	67.5484	318.456	.421	.933
In the age of ICTs role of teacher is to provide services to the learner and he is now monitor and mentor	67.6774	321.359	.327	.934
Integration of ICTs in education has changed the role of teacher as facilitator	67.8710	309.916	.762	.929
Using ICTs teacher becomes coordinator of learning experiences and students become more active participants in the learning process	67.8387	308.006	.746	.929

Students learn more when ICT is used as mode of teaching	67.8065	312.161	.635	.930
Integration of ICTs in teaching enable students to learn in their own way and make choices based on their own perceptions according to their needs	67.7419	314.531	.591	.931
Integration of ICTs enable students make choices based on their own perceptions according to their needs	67.7097	315.680	.547	.931
Use of various kinds of ICTs tools provide rich learning experience to students	68.0645	330.729	.166	.934

Reliability Testing: B.ED TRAINEES QUESTIONNAIRE

For testing the reliability of inter item consistency for the supportive environment for using ICT in teaching and learning process:

The cronbach's alpha appeared as

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.829	.828	6

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Teachers are well updated in use of ICTs in teaching	0.506	0.819
I have enough time to prepare assignments using ICTs	0.554	0.81
I have facilities to ICTs resources at any time in the institution	0.68	0.784
Student learn more when ICT is used as mode of teaching	0.572	0.807
Multimedia tools enhance comprehension and learning	0.625	0.796
I hear and I forgot, I see and I remember, I do and I understand	0.655	0.789

SUUPORTIVE ENVIRONMNT FOR B.ED TRAINEES

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
achers are well updated in e of ICTs in teaching	55.8776	11060.204	.506	.352	.819
nough time to assignments using	54.3741	10542.099	.554	.390	.810
cilities to ICTs sources at any time in the titution	53.1905	9837.580	.680	.475	.784
udent learn more when T is used as mode of aching	54.2381	10290.854	.572	.370	.807
ltimedia tools enhance mprehension and learning	52.4218	9786.684	.625	.667	.796
ear and I forgot, I see and emember, I do and I derstand	53.4694	9760.840	.655	.682	.789